A STUDY OF THE DIET, PHYSICAL ACTIVITY PATTERNS AND ANTHROPOMETRY OF A GROUP OF FREE- LIVING ELDERLY PEOPLE.

BY

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ABSTRACT

1. Information was obtained on the diet, physical activity patterns and anthropometry of a randomly selected sample of 47 males and 48 females aged between 70-71 years old, all of whom lived in their own homes in the medium sized town of Paisley, Scotland and all of whom continued throughout the study with their "normal" daily routine.

2. A weighed food record over 5 consecutive days (including the week-end) was used. The group mean daily intake of energy for males which approximated 1.3 x BMR was below the levels which are usually considered desirable by the FAO/WHO/UNU (1985) and DH (1991). On the other hand, the group mean daily intake of energy for females which approximated 1.4 x BMR met the FAO/WHO/UNU (1985) suggested adequate energy intake level but was below the DH (1991) level.

   For both sexes, group mean daily intake of nutrients, selenium and vitamin D were less than the suggested dietary guidelines DH (1991). Group mean values obtained for protein, calcium, iron, zinc, thiamin, riboflavin, nicotinic acid eq, vitamin C and A were likely to be adequate. The contribution of carbohydrate to dietary energy fell marginally below the desirable level.

3. Each subject kept a diary record of activities for 3 days which also permitted an estimate of total energy expenditure to be made. Generally speaking, most of the elderly engaged in some form of physical activity during the study period, this activity appeared to be of light - medium intensity only. Few engaged in activities of high intensity. Interestingly 59% of the males and 39% of the females considered themselves to be "more active" to "much more active" than others of their own age. Important sex differences on type of activity engaged in are also presented.

4. Little correlation was found between group mean energy intake and estimated energy expenditure during the time of the study, the results suggest that calorie balance is not achieved over a period of a few days. This is in accordance with the results of other workers in other countries.

5. Anthropometric data - bodyweight, height, skinfold thickness, circumference of upper arm, calf, waist and buttocks were obtained. Females were on average smaller than males, weighed less, had smaller waist circumference but thicker biceps, triceps skinfolds and greater percentage body fat than males. (Overweight) BMI (25-30) was common amongst both sexes 60% males and 69% females.

6. The findings suggest a need for further studies on the nutrition status of the elderly in the United Kingdom.

CHAPTER 1

INTRODUCTION

With the steady growth of the free-living elderly population in the United Kingdom and elsewhere there is a need for more research on the diet and physical activity patterns of this group. Currently, there are approximately 10.5 million people of pensionable age in the UK, representing 18% of the population (OPCS, 1991). Over the next 20 years an increase is expected in the total number of people classified as elderly within the population. The most dramatic increase is anticipated in the "very elderly", the number of old people over 85 years is projected to increase by about two-thirds over this period (Government Actuary Department, 1989).

Old age is associated with a progressive biological deterioration and increasing health problems (Euronut-Seneca, 1991) as well as less physical activity which might cause in some people marked diminution in energy expenditure and thus food intake (Durnin, 1973). Consequently, with increased longevity there will be a need for a higher priority in improving the health of the elderly and maintaining their independence for as long as possible, especially since the majority of elderly live in the community. It is a myth and misconception that most elderly people are confined to institutions such as hospitals, nursing homes or residential homes. In the UK the majority 96% are living in the community (Lancet, 1991). Many "very elderly" also live in their own homes and care for themselves, of which half of those over 90 years of age live at home and two fifths of those live alone (Lancet, 1991).

The study of "gerontology", the science of aging as a biological and social phenomenon (Beck and Vivells, 1984) only began in earnest in the 1950's and has expanded in the 1970's. Several authors have been active in this field

in particular J.V.G.A. Durnin and R Shephard who have written several comprehensive reviews on this population age group which have provided useful background information for this study e.g. Durnin's articles in the Textbook of Geriatric Medicine and Gerontology (1973) and Shephard's book on Physical Activity and Aging (1978). However more work still needs to be done, particularly in the UK in order to assess the current prevalence of nutritional problems and as a basis for dietary recommendations (Gray, 1992). Further Munro et al (1987) refers to the need for more data as at present intakes of nutrients normally recommended for the elderly people generally have been derived from limited assessment of the real needs of this group and often rely on extrapolation from the more carefully defined requirements of younger adults. Euronut-Seneca (1991) also makes reference to the need for more data on body composition - anthropometry to form basic descriptive data to establish reference standards.

A review of the current literature on the elderly population in the UK reveals that more attention has been given to the diet of this group, for example the large studies of the DHSS (1972; 1979) and smaller studies by Macleod et al (1974), Lonergan et al (1975); Vir and Love (1979) and Bunker et al (1984). There has however been very little attention paid to the physical activity patterns of the elderly apart from a scattering of studies, notably Dallosso et al (1988) and The General Household Survey (1985). Further, few investigations have studied the correlation of physical activity patterns and diet of the elderly, despite the existence of a number of such reports within the general population. Consideration of this correlation between diet and physical activity patterns should help towards providing a broader

understanding of the nutritional status of the elderly person as according to Davidson et al (1962) both physical activity and the diet of the elderly play two important roles in reducing morbid old age. Durnin also refers to the importance of this correlation - "In simple nutritional terms, when physical activity increases, energy expenditure is also augmented and the energy required to replace the expenditure similarly becomes greater. Appetite will improve and the amount of food eaten is proportionately more. A secondary result of the increased intake of food is that there will also be a greater intake of nutrients - protein, minerals and some vitamins. The activity itself results in improved muscle tone, more muscle and joint mobility, an extension of social contacts, and a general increase in the feeling of "well-being" Durnin (1991).

The main objective of the present study has therefore been to explore the diet and physical activity patterns of a group of free living elderly people. To meet this goal, one particular study Euronut-Seneca (1991) has been invaluable in shaping this original investigation. Since 1986, most European countries have been actively involved in a nutritional study on the elderly under the auspices of Euronut, the EC Concerted Action on Nutrition and Health in the European Community. Some 2600 people born between 1913 and 1918 living at 19 different sites in Europe were studied using strictly standardised methodology. Data so far has been collected on the dietary intake of these people, their nutritional status, physical activity, lifestyle, health and performance. The present study has incorporated some of the standardised methodology and procedures used in the Euronut study and reference is made to Euronut throughout the text where appropriate.

The present study is intended to provide information on the following:-

1) The intake of energy and nutrients of the elderly and background information on their dietary patterns.
2) A profile of the physical activity patterns of this group and to make a rough estimate of energy expenditure.
3) Basic descriptive data on anthropometry.
4) Background information on the socio-economic status, lifestyle and self - perceived activity and health of the elderly.

To meet these objectives, it was decided to study one of the age group cohorts used in the Euronut project - 70-71 year olds and a group of randomly selected elderly males and females living unsupported in their own homes in a medium sized town, Paisley, Scotland and being "apparently" healthy was studied. For the assessment of energy and nutrient intake a 5 day weighed record was used and a 3 day activity diary provided a profile of all daily activities and an estimate of energy expenditure using literature sources - FAO\WHO\UNU (1985); DH (1991) provided very satisfactory references on which to make an estimate of energy expenditure as they cover a wide range of values. In addition a questionnaire was used to obtain information about the socio-economic status, lifestyle, activities of daily living, self-perceived health, activity and diet habits of the older person. Anthropometry was undertaken to provide much needed basic descriptive data, all methods and procedures used were highly standardised and are described in full in Chapter 2.

CHAPTER 2

METHODS AND SUBJECTS

The study was conducted in the medium sized town of Paisley, 12 miles west of Glasgow, Scotland. In 1991, Paisley had a population size of 80,561. The most recent survey in Paisley which shows the age group split of the population was carried out in 1987 in which 1,337 (4%) males and 2,037 (5%) females were aged 70-74 years old (Strathclyde Region, 1992). In terms of Paisley's socio-economic structure and population size of the elderly, the area is symptomatic of the country as a whole. The town is compact, clearly defined geographically and was easily accessible to the researcher. Local work opportunities are largely commercial, administrative and industrial. Retirement age is 65 years for males and 60 years for females. Paisley has a well developed network of local organisations for the elderly of social clubs, meals on wheels etc. There are also 54 general practitioners in the area, 5 nursing homes in Paisley and 392 geriatric beds; this figure including a number of geriatric assessment beds.

THE DRAWING OF THE SAMPLE

Argyll and Clyde Health Board provided a general practitioners patients record of persons aged 70-71 years old living in their own homes in Paisley. This list served as a basis for random sampling and all persons selected were numbered in random order. One person in three was invited to participate by means of a letter until the aimed sample size was reached. A second letter was sent to each general practitioner in Paisley informing them of the study and asking if they had any objections to any of their patients being invited to participate in the study.

TABLE 2.1

SUMMARY OF THE NUMBERS DRAWN IN THE SAMPLE AND RESPONSE

DERIVATION OF SAMPLE	MALES	FEMALES
A Total sample drawn	118	120
B Not traced	6	8
C Reported dead	8	6
D Live sample A - (B-C)	104	106
E Ineligible [1]	10	11
F Eligible sample D-E	94	95
G GP refused or advised against participation	-	-
H Refused to participate	46	43
I Participated in study	48	52

Note: 1 Those ineligible cases at E included those found to be under 70 yrs or over 71 years.
Those not living in their own homes e.g. nursing homes
Those mentally ill or not fluent in English, or unable to answer independently

Table 2.1 shows the numbers drawn in the sample, those excluded for various reasons and those who participated in the study. Approximately half of the eligible sample of elderly males and females 51% and 55% respectively, took part in the study. Loss from the sample from failure to trace or death could be partially due to the unevenness in the quality of data recorded in the patients list and the differing period of time between drawing the sample and making contact with the subjects. Any non-responders or persons unwilling to participate were contacted by telephone and the reasons for not wanting to take part were recorded (table 2.2) the most commonly mentioned was being too busy to participate. 2 males and 2 females felt that they were all right and "did not need" to take part.

TABLE 2.2

REASONS FOR REFUSAL TO PARTICIPATE IN STUDY

REASON GIVEN	MALES	FEMALES
Too Busy	34	30
Too Old	4	4
Not Interested	5	6
"Did not need" because all right	2	2
Relatives Unwilling	-	1
No Reason Given	1	-
TOTALS	46	43

The numbers of the participants who completed the study satisfactorily and whose records have been used are shown in table 2.3. Values for any subject who reported illness during the study have also been omitted.

TABLE 2.3

SUMMARY OF SUBJECTS WHOSE RECORDS HAVE BEEN ANALYSED

	MALES	FEMALES
Participated in study	48	52
Questionnaire	47	48
Weighed Food Intake Record	47	48
Physical Activity Diaries	44	47
Anthropometric Measurements	45	48

Note: 1 Female and 2 males participated in food intake record but didn't have the time to take part in physical activity diaries

Table 2.4 shows the social and economic make up of those elderly males and females whose records were analysed.

MARITAL STATUS, LIVING SITUATION, AGE AND SOCIAL CLASS

The majority of subjects were married and lived in a family house with a garden. Of those subjects who were either single/divorced or widowed, 15 lived in an apartment building and 10 stayed in a family house with garden. 43% of males and 48% of females were aged 70 years and 57% of males and 52% of females were aged 71 years old.

Information on previous occupation was obtained from elderly male and female participants in order to group the subjects by social class. For married females their husbands occupation was used for this purpose. Social class is useful to group individuals together who should theoretically have lived in the same environment and have been exposed to similar intrinsic and extrinsic environmental pressures. It is acknowledged this is only a very rough guide and changes in living conditions, death, health etc. may alter the current way of life of the elderly subjects. A high percentage of elderly males 77% and 69% females could be categorised into social class C1 and C2. The proportion of higher managerial, administrative or professional - social class A was 4% males and 6% females. 13% males and 10% females could be classified into social class D - semi and unskilled manual. The subjects were further asked about the main source of income coming into the home. They were not asked to disclose how much they received and it was not possible to verify their answers. The main source of income reported was the pension of which 86% had an employers pension plus the old age pension.

TABLE 2.4

MARITAL STATUS, LIVING SITUATION, SOCIAL CLASS AND AGE OF ELDERLY MALE AND FEMALE PARTICIPANTS

"N" 95	Total Percentage
MARITAL STATUS	
Single	6
Married	75
Divorced	2
Widowed	17
LIVING SITUATION	
Institution	-
Apartment Building	35
Family House with Garden	65
Family House without Garden	-
Other	-
SOCIAL CLASS	
A	5
B	11
C1	36
C2	37
D	12
AGE	
70	45
71	55

QUESTIONNAIRE

The general questionnaire consisted of a package of questions and an interviewer's evaluation which was based on the Euronut - Seneca questionnaire prepared by de Groot and van Staveren (1988). The questionnaire was designed to obtain information on socio-demographical situation, socio-economic status, life style, social network, health, self-perceived health, activities of daily living, physical activities and diet habits of elderly people. The questionnaire was carried out before the weighed food record and activity record commenced and the same set of questions was asked of each participant. Statistical analysis was carried out using the SPSS package (SPSS, 1991).

5 DAY WEIGHED FOOD RECORD

For the food record, the subjects weighed and recorded everything that they ate and drank for a period of 5 consecutive days, including a weekend.

The subjects who agreed to take part were visited by the interviewer the day before they were due to start weighing their food. A clear set of standard instructions to follow was given as described in Cameron & van Staveren (1988) and a demonstration of how to weigh and record food was shown. It was stressed to all subjects that they were not to change their eating habits or their ordinary daily routine during the study period.

After the subjects had repeated the demonstration successfully, they were provided with a food intake booklet and a set of solex electronic scales (5 kilogrammes/11 pounds) large capacity, necessary to accommodate both the plates and food.

All food and beverage was weighed in the edible form and each item was recorded in grammes, along with a full description of each food. Any leftovers were re-weighed and recorded. In order not to interfere with normal eating habits, any food eaten outside the home where possible was weighed or in the instances where this was not possible, the subjects were asked to describe the food eaten, place of purchase and an estimate of quantities of food eaten was made using data available from The British Dietetic Association (1988). The subjects were visited once after the initial instruction to check on progress and the interviewer kept in touch with each subject regularly by telephone during this period. It was necessary to pay a further visit to one female who needed to be further reassured. The day after completion of the records, the subjects were revisited and the records were thoroughly reviewed in detail to ensure that all the necessary information had been recorded.

Food codes were then allocated to each food item using the food tables of Paul and Southgate (1978) and supplementary tables available from Lifeline Nutritional Services Limited.

Total daily energy and nutrients were calculated using Comp-Eat 4.0 software package developed by Lifeline Nutritional Services Limited.

PHYSICAL ACTIVITY

This was estimated using the standard diary technique during 3 consecutive days similar to those described by Garry et al (1955).

The day before the subjects began recording their diaries, the interviewer supplied the participants with 3 days activity diaries and gave clear, simple instructions and a demonstration on how to record each day's activities. Each

subject recorded his or her activity in the booklet with a separate 24 hour diary for each day. The diary was divided into 1440, 1 minute blocks. Different code letters were used to denote different activities, the first entry to be entered was the time the subject got up, the last entry when they went to bed and only when their activity changed was a new box was to be filled in with the appropriate code. After the initial instruction, the interviewer visited subjects to check on progress and on two separate occasions made a further visit to two females homes to give reassurance. At the end of the study period a final interview was carried out whereby each day's diary was meticulously checked by the interviewer.

ESTIMATED ENERGY EXPENDITURE

An estimate of total energy expenditure was calculated first by estimating the basal metabolic rate using the appropriate equations for sex and age for each subject from tables of the DH (1991), then multiplying by the assigned values for energy costs derived from available literature sources (DH, 1991; FAO/WHO/UNU, 1985; James and Schofield, 1990) appropriate to each activity and multiplying by the duration of minutes for each activity, the mean total energy expenditure for the 3 days could then be easily calculated.

ANTHROPOMETRY

Anthropometric data was collected from each individual after the food intake record and physical activity records were completed using standardised methodology.

HEIGHT

Standing height was measured to the nearest 0.1 cm using a Harpenden Pocket Stadiometer (Holtain Ltd).

The subject stood on the base plate with feet flat on the ground, heels together, wearing no shoes, the shoulders relaxed, arms at the sides and standing straight. The tape was extended upwards until the head bar rested lightly on the subject's head. Each subject raised themselves to full height aided by gentle upward pressure by the measurer on the mastoid processes. Some difficulty was encountered in measuring height of one male due to the degree of kyphosis or curvature of the spine, height was measured with subject's back as straight as could be managed.

WEIGHT

Body weight was measured in kilogrammes using calibrated digital scales (Salter UK). Each subject was weighed wearing only light undergarments.

Body mass index was derived from weight in kilograms/height in metres^2.

SKINFOLD THICKNESS

Measurements of skinfold thickness were taken by the same investigator at 4 sites - triceps, biceps, subscapular and supra-iliac using calibrated calipers (Holtain Ltd - Crymych UK) to the nearest mm.

All measurements were repeated three times on the left side. The skinfold was picked up between thumb and forefinger at exactly the level marked and calipers applied, the measurement was read at the time the readings started to stabilise after two or three seconds.

TRICEPS

The subject had their arm bent at right angles, the length from the tip of the acromion process on the scapula to the olecranon process of the ulna was

measured and the mid point marked. With arms hanging loosely by the side, the skinfold was picked up about 1cm above the level marked on the skin.

BICEPS

The skinfold was picked up on the front of the arm, directly above the centre of the cubital fossa and at the same level as that at which the tricep skinfold was measured.

SUBSCAPULAR

Was measured about 1 inch in and below the angle of the scapula towards the mid line and at an angle of approximately 45° to the spine along the natural line of skin cleavage.

SUPRA-ILIAC

The skinfold was measured approximately 1cm above and 2cm medial to the anterior superior iliac spine.

TOTAL BODY FAT

Was estimated from the sum of all four skinfolds using the appropriate equations for males and females devised by Durnin and Wormesley (1974).

CIRCUMFERENCES

4 circumferences were measured on each subject. The maximum calf circumference was taken with the subject sitting, where possible on a table with leg hanging free. The upper arm, waist and buttocks circumferences were taken in the standing position. Each subject stood with feet fairly close together with weight equally divided over both legs. Measurements were taken in duplicate using a Harpenden Anthropometric Tape (Holtain Ltd) and taken to the nearest cm.

UPPER ARM

Was measured with the subject's arm hanging relaxed, just away from his side and the circumference was taken horizontally on the axial line of the upper arm at the level marked for the triceps - skinfold measurement. Measurements were made on the left side.

WAIST

Was measured mid way between the lower rib margin and the iliac crest, at the end of gentle expiration, perpendicular on the axial line of the trunk.

BUTTOCKS

Was taken over the maximum circumference of the buttocks, at the level of the greater trochanters.

CALF

Was measured over the maximum circumference of the calf with his leg hanging freely. Circumference was taken horizontally.

CHAPTER 3

ANTHROPOMETRIC DATA

Basic descriptive data for this group of elderly males and females is shown as Mean Values, Standard Deviations and Ranges for:-

1. Weight (kg), Height (cm), Body Mass Index (kg/m^2) and % Body Fat in table 3.1.

2. Skinfold thickness at selected body sites, triceps, biceps, subscapular and supra-iliac, in table 3.2.

3. Circumferences at selected body sites, upperarm, waist, buttocks and calf in table 3.3.

TABLE 3.1

DESCRIPTION (MEAN VALUES ± SD AND (RANGES) FOR ANTHROPOMETRIC INDICES OF ELDERLY MALES AND FEMALES STUDIED.

GROUP	No OF SUBJECTS	WEIGHT (kg)	HEIGHT (cm)	BMI ($kg\backslash m^2$)	BODY FAT (%)
MALES	45	73.8 ± 11.3 (53.6 - 100.0)	170.0 ± 6.7 (156.1 - 182.3)	25.6 ± 3.3 (17.7 - 34.8)	23.7 ± 5.3 (14.0 - 34.0)
FEMALES	48	65.1 ± 11.5 (40.4 - 102.5)	157.3 ± 5.8 (143.0 - 172.0)	26.6 ± 4.3 (17.1 - 37.7)	32.1 ± 4.6 (20.1 - 40.5)

TABLE 3.2

SKINFOLD THICKNESS (MEAN VALUES ± SD AND RANGES) AT SELECTED BODY SITES FOR ELDERLY MALES AND FEMALES.

GROUPS	No OF SUBJECTS	TRICEPS SKINFOLD(mm)	BICEPS SKINFOLD (mm)	SUB-SCAPULAR SKINFOLD (mm)	SUPRA-ILIAC SKINFOLD (mm)
MALES	45	13.0 ± 4.7 (5.0 - 25.0)	6.0 ± 2.1 (3.0 - 10.0)	16.0 ± 4.6 (9.0 - 26.0)	17.0 ± 6.3 (6.0 - 36)
FEMALES	48	22.0 ± 5.3 (9.0 - 34.0)	11.0 ± 5.2 (4.0 - 25.0)	17.0 ± 16.2 (7.0 - 32.0)	16.0 ± 6.8 (4.0 - 30.0)

TABLE 3.3

CIRCUMFERENCES (MEAN VALUES ± SD AND RANGES) AT SELECTED BODY SITES FOR ELDERLY MALES AND FEMALES.

GROUP	No OF SUBJECTS	UPPER ARM CIRCUMFERENCE (cm)	WAIST CIRCUMFERENCE (cm)	BUTTOCKS CIRCUMFERENCE (cm)	CALF CIRCUMFERENCE (cm)
MALES	45	28.0 ± 2.3 (22.0 - 34.0)	91.0 ± 9.0 (70.0 - 106.0)	100.0 ± 5.9 (89.0 - 113.0)	35.0 ± 2.3 (28.0 - 41.0)
FEMALES	48	28.0 ± 3.0 (20.0 - 39.0)	84.0 ± 11.4 (63.0 - 116.0)	102.0 ± 9.2 (82.0 - 127.0)	35.0 ± 3.3 (28.0 - 42.0)

RESULTS

HEIGHT

Mean height for males and females is shown in table 3.1. Females tended to be smaller than males on average by about 12.7 cm. Only 9% females were taller than 160cm whereas only 35% males were smaller than 160cm.

WEIGHT AND BODY MASS INDEX

Mean bodyweight for males and females are given in table 3.1. The results of the females covered a wider range of values 40.4 - 102.5kg than that of males 53.6 - 100.0kg. Females on average weighed less than 70kg 73%, whereas a greater percentage of males weighed more than 70kg 59%, of which 27% males and 10% females weighed more than 80kg.

Males and females had similar group mean values for Body Mass Index given in table 3.1. If an international classification of Body Mass Index (Garrow, 1981) is used then overweight (25-30) is common amongst both males 60% and females 69%. Prevalence of obesity using BMI criterion (BMI > 30) was higher amongst males 13% than females 10% - of which 2% females were very obese i.e. (BMI > 40) with a further 4% borderline cases. A small proportion of the elderly group were underweight as defined by a (BMI < 20) - 2% males and 6% females. This data will be discussed later and accepted definitions of obesity in terms of BMI will be analysed.

% BODYFAT AND SKINFOLD MEASUREMENTS

Mean percentage of body fat was greater in the females than males (table 3.1). The mean triceps skinfold measurement of females 22.0± 5.3mm exceeded that of males 13.0± 4.7mm, for both sexes a wide range of values was observed 5.0 - 25.0mm males and 9.0 -34.0mm females (table 3.2). Likewise females had a greater mean biceps skinfold 11.0± 5.2mm against 6.0± 2.1mm for males. The range of values for the biceps skinfold was greater amongst the females 4.0 - 25.0mm. By contrast, the effects of sex and skinfold site were less marked for the sub-scapular and supra-iliac sites where by a wide range of values was observed in both sexes.

THE RELATIONSHIP BETWEEN % BODY FAT AND BMI

Statistical analysis revealed there was only a general association between Body Mass Index and % Body Fat derived from skinfold thickness. The association was stronger in females - correlation co-efficient 0.6 and 0.5 males. This would suggest that these two indices which are often used interchangeably to estimate adiposity (body fat) provide independent information on the body composition in elderly individuals.

BODY CIRCUMFERENCES - TABLE 3.3

There was no sex differentiation between mean values observed for upperarm and calf muscle and ranges were similar. Females had smaller waist circumferences. The ranges for waist and buttocks measurements showed a wider range of values between the sexes.

DISCUSSION AND LIMITATIONS OF STUDY

One of the purposes of the study was to provide data on simple and combined anthropometric measurements (means and ranges) obtained from reasonably healthy elderly groups of males and females.

Anthropometric measurements, despite many investigator's reluctance to undertake such measurements, can be made relatively simply (Durnin, 1989). Indeed measurements of skinfold at multiple sites are quite capable of providing a satisfactory estimate of total body fat in adults. However the basic data to validate reliability in the elderly are not yet available in sufficient quantity (Durnin, 1989) and on the basis of single one time anthropometric measures any relationship to the nutritional status of individuals in the context of the present study has been treated with due caution. Interpretation of the results has also been further complicated since the function - and health - related consequences of all levels are still a matter of debate in older adults (Andres, 1985). Significant changes in body composition occur with ageing, particularly the reciprocal changes in lean body mass and body fat (Forbes et al, 1976) as well as changes in the distribution of body fat (Borkar et al, 1977) alternations in skin thickness (Lee et al, 1965), elasticity (Grahame et al, 1970), compressibility of the skin and precision of the skinfold measurements (Daly et al, 1979), height is more difficult to measure in the elderly due to bending back - (kyphosis) and in the case of shrinkage of the spinal column, Body Mass Index is thus difficult to interpret (Durnin, 1989) and uncertainties about lung volumes and bone densities to percentage of fat in old age (Shephard, 1978). Nevertheless the results obtained should be treated as basic descriptive data.

In order to increase the accuracy of the data presented certain criteria were

observed (see also methodology chapter two). The same investigator carried out all the measurements and was trained at the start of the research project, whereby the different techniques were checked using duplicate measurements by an experienced technician. Hyner et al (1986) has shown that novices can measure skinfolds as accurately as experienced technicians. Skinfold thickness was measured at four body sites rather than using one single skinfold which does not take account of the possibilities of differing distributions of subcutaneous fat in the body between individuals. Throughout the study the same calipers were used and calibrated therefore any potential problems with the apparatus can be discounted.

Predicted formula by Durnin and Womersley (1974) which was used in this study to estimate the percentage of body fat from skinfold thickness was appropriate as it has the advantage of being developed in Glasgow and calculated on moderately sedentary subjects - the group of elderly males and females studied who were also sedentary living in Paisley, a medium sized town outside Glasgow.

The results from the group mean Anthropometric Measurements of the sex specific descriptives for Height, Weight, Body Mass Index, Skinfold Thickness and Circumferences revealed the following patterns which are summarised -

1. Females were on average smaller than males and weighed less.
2. Females had thicker triceps, biceps skinfold and greater percentage of body fat than males. Examination of other studies have shown at common measurement sites, sex differences in the thickness and distribution of subcutaneous fat persists into old age (Ljunggren, 1963; Parizkova, 1963, 1964; Young 1965; Canada Fitness Survey, 1983; Shephard, 1986a).

3. Similar mean circumference measurements were obtained between both sexes, upperarm and calf. Females had a smaller waist circumference and there was no marked difference between buttocks circumference although the range of values was greater for females.
4. Overweight was common amongst both sexes 60% males and 69% females, overweight being categorised by Body Mass Index range 25-30. The incidence of obesity as suggested by a body mass index of 30 or higher was prevalent amongst 13% males and 10% females, of which 2% females could be described as grossly obese with a further 4% borderline cases.

There is substantial evidence to suggest that gross obesity is associated with risks to health (Gray et al, 1990). However, the relationship of moderate obesity to health of an elderly person remains controversial. Several authors have stated that moderate obesity could possibly be an advantage to the well being of the elderly Andres (1985), Mattila et al (1986). Indeed Durnin (1989) states moderate degrees of fatness are almost certainly of no medical or physical disadvantage to the elderly of either sex. Several recent studies have also demonstrated there maybe benefits in being lean as a young adult, but the lowest mortality in later adult life is observed in those who have accumulated an additional 10% mass over the adult span (Garn et al, 1983; Rhoades and Kagan, 1983; Avons, Ducumetiere and Rakatova, 1983). Indeed, when elderly individuals are in a state of negative calorie balance a store of energy may be useful provided that the individual is not grossly obese.

Reported low Body Mass Index i.e. less than 20 is always a cause for concern. In the present study 2% males and 6% females were described as being underweight. Andres (1985) states that these low values are possible signs of malnutrition. Our knowledge of the nutritional status of these individuals is too limited at the present to substantiate any claims concerning their

well-being. However, at the time of the study these individuals appeared to be reasonably healthy, reported no apparent medical problems, where not dieting and had observed adequate energy intake as suggested by FAO/WHO/UNU (1985) on the basis of 1.4 x BMR. It could be possible that where no apparent signs of ill health were seen, these individuals for some other reason were unable to sustain weight within an acceptable range for height. Nevertheless, it is reasonable to assume that individuals with low fat reserves while not an immediate nutritional hazard in a healthy individual, does imply a reduced capability of responding to nutritional emergencies.

The results from the present study provide a valuable profile of the anthropometric indices which have been found in a reasonably healthy group of elderly males and females. As regards the present study, the data must be treated with caution due to the small sample size and it must be borne in mind that a great deal of work still needs to be done with the elderly in establishing appropriate reference standards before we can satisfactorily validate the present results. More body composition data, which can be used as indicators of subcutaneous fatness, bodyfat distribution and muscle mass, along with combined longitudinal anthropometric and health data is required (Chumlea et al, 1989). Further, for future research the real advances will come when we can link these anthropometric measurements to some functional tests (Durnin, 1989).

CHAPTER 4

DIETARY HABITS AND ATTITUDES

1. The average daily consumption of food groups by elderly males and females is shown in table 5.26

2. Average daily consumption of individual food items is given in appendix A (detailed tables A1 - A11)

3. Percentage of males and females consuming individual food items at various meal occasions, breakfast, lunch, tea and snacks is shown in appendix A - (detailed tables A12 - A18)

4. Descriptive data on cooking and shopping habits of the elderly male and female subjects is shown in table 4.1

5. Diets and specific food eaten by elderly male and female subjects is given in table 4.2

CHAPTER 4

DIETARY HABITS AND ATTITUDES

The study primarily concentrates on the assessment of dietary intake of the elderly male and female participants. However, data has also been collated on the dietary patterns and attitudes of these subjects which are of particular importance in the broadest sense to their nutritional status and health.

RESULTS AND DISCUSSION

MEAL PATTERNS

The following is a description of the general trends observed in the meal patterns of the elderly males and females at separate meal occasions during the five day study period.

Breakfast was particularly popular amongst this group of elderly males and females, undoubtedly a major reason for this being more relaxed regime permitted to those who no longer have to chase the clock to a work place as discussed by Taylor Nelson (1987). Breakfast for both sexes generally followed a similar routine pattern each day and was dominated by a handful of products (appendices A12 to A18) - bread and rolls (mainly bread which was nearly always toasted), breakfast cereals (which included porridge), fruits (mainly fresh), fats (mainly margarine), preserves and eggs. Cheese and bacon were less popular at this meal occasion. Both males and females were strong consumers of tea with milk at breakfast time and fruit juice (mainly fresh orange juice) was popular especially amongst the females.

The lunch time meal (appendices A12 to A18) did not always coincide with the preconceived idea that the over 65's still treat their lunch time as their main meal of the day, (Taylor Nelson, 1987). In the present study, a trend

was observed towards a lighter lunch and the main meal was taken in the evening. The reasons for this departure from tradition could be further investigated. Thus soups, particularly home-made, were popular amongst both sexes. Cold meats, in particular beef and chicken, were more frequently eaten at lunch times rather than at the evening meal as were breads and rolls, which were served buttered or with margarine along with soup or filled with meats or cheese. Salad vegetables were frequently taken at this time. Those having a dessert favoured fruits, yogurts, biscuits and cheese and especially cakes/tarts and pastries which was followed mainly by tea with milk.

Bread/rolls, fats and soup were still popular as part of the evening meal, which tended towards a more traditional form consisting mainly of two courses (appendices A12 to A18). The main course was frequently based on meat, vegetables and potatoes. Beef, poultry, bacon and ham being the preferred cuts of meat and there was a marked preference for hot dishes particularly home-made casseroles and savoury meat dishes. Convenience products and pre-prepared meat dishes were not so popular. Potatoes and vegetables, especially fresh, were more popular as part of the evening meal than at lunch times. Fish as an alternative to meat was more frequently preferred as part of the evening meal than at lunch times. Traditional puddings i.e. jellies, milk puddings, custards etc were also more popular as part of the evening meal than at lunch times. However, cakes, tarts, pastries, fruits, ice cream, mousses and yogurts were the most frequently reported dessert item. The evening meal was accompanied by the tea with milk. Other beverages such as alcoholic drinks were also reported by several elderly males and female at this meal occasion.

Snacks were consumed frequently by nearly all the subjects during the study period (appendices A12 to A18) - the most popular being biscuits, cakes, tarts, pastries, rolls and breads, hence the consumption of fats, preserves

and cheese. Neither sex appeared to have adopted the idea of a snack being a light meal or substitute for a meal, being perceived as merely a quick bite between meals. The only other snack products worthy of note for this group were fresh fruits. Sweets and chocolate were not as popular as one might have expected. Beverage consumption mainly consisted of tea although coffee was more popular on snack occasions than at any other time. Alcoholic beverages were also popular amongst some males at snack time.

Cooking, shopping habits, specific foods eaten and diets of the elderly males and females were investigated by way of the questionnaire (table 4.1 to 4.2) What follows is a general description of the reported results -

COOKING AND SHOPPING HABITS

All elderly participants had cooking facilities and fridges of their own. They were all able to cook a hot meal such as meat and two vegetables although 39% males all of whom were married and their wives did the cooking, never or sometimes cooked a meal. Meals were mainly taken in the home. Only occasionally were meals taken at friends' homes or restaurants,cafes etc. A cooked meal was taken every day.

Shopping was reported frequently e.g. twice or more weekly by the majority of subjects 89% males and 98% females. The social aspects of shopping were one of the reasons highlighted for this frequency. Shopping facilities were reported close by or at walking distance by the majority of elderly males and females and this was one of the reasons why 98% males and 92% females reported shopping was no problem. Poor mobility caused 2% females 2% males to find shopping a real problem having to rely on others to do the shopping. Of the remaining 9% males who never shopped for food, this was not because of any physical impairment but due to their wives or other family members who did the shopping.

DESCRIPTIVE DATA ON COOKING AND SHOPPING HABITS OF ELDERLY MALES AND FEMALES

	MALES (%)	FEMALES (%)
"N"	47	48
ABILITY TO PREPARE A HOT MEAL ON THEIR OWN		
With ease	64	100
Able to manage	36	-
With difficulty	-	-
Not at all	-	-
SHOPPING FREQUENCY -		
Never - Males	11	2
Females	-	-
Twice or more weekly	57	71
Daily	32	27
FOOD BUDGET DIFFICULTIES -		
Quite often	4	4
Sometimes	23	21
Rarely	9	13
Never	64	63
DISTANCE TO SHOPS -		
Close by	38	27
Walking	38	46
Other	23	27
SHOPPING IS CONSIDERED -		
A real problem	2	2
Inconvenient	-	6
No problem	98	92

A small percentage of the subjects reported having food budgeting difficulties quite often, three of whom were married and one person was single, for example they were not able to manage their expenditure for foods. It is known that food budgeting problems have a strong impact on dietary intake and nutritional status (Colucci, Bell and Blackburn, 1987) thus the nutritional data of subjects with budgeting difficulities could be further investigated at a later stage. A further fifteen married couples and six persons who were either single, divorced or widowed found food budgeting difficulties sometimes. Although only two of these married couples and one widowed person described having shopping difficulties due to food budgeting problems.

DIET AND SPECIFIC FOODS - Table 4.2

A small percentage of the subjects stated they were on a specific diet. 6% males and 6% females said they were trying to lose weight and were following an eating plan prescribed either by a doctor or dietitician. One female was a vegetarian and had been on this form of diet since childhood, due to disliking meat. A high percentage of subjects reported including or avoiding specific foods, no prompting was given by the interviewer when asking these questions.

The elderly are renowned for their dietary conservatism. Indeed, in a recent research study conducted by Mori 1992, (67%) of elderly questioned stated they are used to the food they eat and don't want to change. In the present study many of the subjects certainly seem to be aware of certain healthy dietary messages, such as avoiding fatty meats, including certain foods such as margarine and brown bread, fruit and vegetables, (of which 7% of males and 13% of females grew their own). Cakes, Sweets, Salt, Cream and Butter were less avoided than other food items for health reasons.

Some of these dietary habits reported by the subjects could most definitely relate to their nutritional intakes and future analyses could reveal the extent to this.

TABLE 4.2

DIETS AND SPECIFIC FOODS EATEN BY THE ELDERLY MALES AND FEMALES

	MALES (%)	FEMALES (%)
"N"	47	48
SUBJECTS WHO STATED THEY WERE ON A ON A SPECIFIC DIET - A	6	8
Diets:	6	6
Weight loss diet -	-	2
Vegetarian diet -		
SUBJECTS WHO AVOID CERTAIN FOODS - B	92	92
Meat	-	2
Fatty Meat	75	79
Fried/Burned Meat	49	54
Smoked Foods	36	46
Sausages	23	33
Cream/Butter	36	40
Cakes and Sweets	19	18
Salt	15	2
Sugar	40	48
Artificial colourants	32	31
Coffee	23	21
Eating in between meals	15	19
SUBJECTS WHO INCLUDE CERTAIN FOODS - C	89	92
Raw Vegetables and fruit	70	77
Yogurt	30	48
Margarine	62	67
Brown Bread	66	73
Dietary supplements, vitamins	27	27
Health foods	11	13
CONSUME HOME PRODUCED FOODS - D	30	27
Vegetables	26	23
Fruit	21	13

NOTES:

A - Subjects were asked if they were on a prescribed diet and if YES, what kind of diet was it? Question A shows the two specific diets reported.

B - A list of foods and foodstuffs were read out to each subject.

C - Subjects were asked to answer YES or NO as to whether they avoided or included these foods for health reasons. No prompting was given by the investigator.

D - Subjects were asked if they ate any home produced foods. A list of foods was read out to each subject which required a YES or NO answer. Question D shows the response given.

CHAPTER 5

RESULTS

INTAKE OF ENERGY AND NUTRIENTS

1. The dietary findings for energy and nutrients for elderly males and females are given as means, standard deviations and ranges in tables 5.1 and 5.2.

2. The findings are also expressed as percentages of the UK Dietary Reference Values (Department of Health, 1991) and as percentages of persons whose daily intake fell between +1 or -1 standard deviation of the group means in table 5.3 to table 5.24.

3. Table 5.5 to table 5.25 shows the relative importance of various groups of food as contributors to average intake of various nutrients and energy, expressed as percentages.

4. Table 5.26 shows average daily consumption of food groups by elderly males and females. Further information on daily consumption of individual foods is given in appendix A (tables A1 - A11).

5. Finally, appendix A (detailed graphs A19 - A30) shows individual mean daily intake of various nutrients for elderly males and females and BMR ratio plotted against energy intake for both sexes.

RESULTS

TABLE 5.1

DAILY INTAKES OF ENERGY AND NUTRIENTS FOR ELDERLY MALES.

(Means Values, Standards Deviations and Ranges)

	MALES	
NUTRIENT	**MEAN (SD)**	**RANGE**
Energy (Kcal)	1972 (328)	852 - 2943
(KJ)	8284 (1374)	3596 - 12326
% Energy Fat	36.4 (5)	20.3 - 45.8
% Energy Protein	16.4 (3)	11.2 - 26
% Energy Carbohydrate	44 (6)	30 - 61.1
% Energy Alcohol	3.4 (6)	0 - 22.7
% Energy Sugar	16.6 (5)	10 - 31
Protein (g)	80.07 (18)	43.65 - 143.51
Fat (g)	80.05 (19)	29.72 - 142.01
Carbohydrate (g)	228.58 (46)	109.76 - 354.63
Fibre (NSP) (g)	11.26 (5)	5.46 - 24.90
Calcium (mg)	808 (212)	331 - 1549
Iron (mg)	12.64 (3)	6.62 - 24.78
Zinc (mg)	10.36 (3)	5.23 - 21.84
Selenium (μg)	39.76 (16)	10.52 - 72.55
Thiamin (mg)	1.34 (0.3)	0.55 - 1.88
Riboflavin (mg)	1.68 (0.5)	0.59 - 2.99
Nic AC eg (mg)	35.17 (8)	21.29 - 64.04
Vitamin B6 (mg)	1.77 (0.5)	0.80 - 3.16
Vitamin B12 (μg)	6.85 (7)	1.63 - 50.49
Vitamin C (mg)	50 (30)	7 - 141
Vitamin A (μg)	927 (1430)	57 - 9737
Vitamin D (μg)	4.320 (5)	0 - 24.282

NOTES:- Values for 3 males who were dieting at the time of the study were not included in means.

TABLE 5.2

DAILY INTAKES OF ENERGY AND NUTRIENTS FOR ELDERLY FEMALES.

(Means Values, Standards Deviations and Ranges)

	FEMALES	
NUTRIENTS	**MEAN (SD)**	**RANGE**
Energy (Kcal)	1745 (243)	1326 - 2353
(Kj)	7333 (1020)	5542 - 9854
% Energy Fat	38.4 (5)	19.8 - 50.9
% Energy Protein	16.8 (3)	12.1 - 23.5
% Energy Carbohydrate	43.4 (5)	34.8 - 60.9
% Energy Alcohol	1.2 (2)	0.0 - 9.2
% Energy Sugar	16.9 (6)	9.2 - 28.5
Protein (g)	73.13 (14)	42.22 - 105.05
Fat (g)	74.80 (17)	36.37 - 116.05
Carbohydrate (g)	201.67 (32)	139.99 - 267.88
Fibre (NSP) (g)	11.0 (5)	3.55 - 29.27
Calcium (mg)	780 (210)	258 - 1502
Iron (mg)	11.76 (3)	7.54 - 20.01
Zinc (mg)	9.11 (3)	3.44 - 15.74
Selenium (μg)	28.77 (14)	2.81 - 65.04
Thiamin (mg)	1.25 (0.3)	0.78 - 2.09
Riboflavin (mg)	1.58 (0.5)	0.69 - 3.05
Nic AC eg (mg)	31.11 (7)	15.82 - 47.51
Vitamin B6 (mg)	1.64 (0.4)	0.70 - 2.77
Vitamin B12 (μg)	5.55 (7)	1.54 - 41.75
Vitamin C (mg)	58 (31)	13 - 154
Vitamin A (μg)	967 (1308)	82 - 7536
Vitamin D (μg)	2.983 (3)	0.287 - 14.610

NOTE:- Values for 3 females who were dieting at the time of the study were not included in means.

ENERGY INTAKE

Tables 5.1 and 5.2 show calculated group mean intakes of energy - descriptive data for both sex groups is given in table 5.3. Males had a higher mean intake of energy than females, by about 227 Kcal/d. This sex difference was removed by expressing energy intake on the basis of body weight, which could suggest that this sex difference may be partially due to differering body size of males and females. Approximately one quarter (31%) of the males and one half (51%) of the females had intakes equal to or greater than 1.4 x BMR (table 5.4). Some of the results in this table are unexpected and are discussed more fully later.

TABLE 5.3 DESCRIPTIVE DATA ON MEAN ENERGY INTAKE OF ELDERLY MALES AND FEMALES.

	MALES	FEMALE
"N"	47	48
Mean Kcal\Mean weight (kg)	27.0	28.0
Percentage within +1 or -1 (sd) of the Mean	64	63

TABLE 5.4. PERCENTAGE DISTRIBUTION OF CALCULATED MEAN RATIO'S OF ENERGY INTAKE TO BASAL METABOLIC RATE *1 FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
[2]"N"	42	45
Mean [3]E1/BMR	1.3	1.4
1.5 x BMR or Greater	17%	27%
1.4 x BMR	14%	24%
1.3 x BMR	21%	16%
1.2 x BMR	14%	18%
Less than 1.2 x BMR	33%	16%

Notes:-

[1] BMR calculated from DHSS (1991) equations.
[2] 3 males and 3 females who were dieting excluded from mean values and weight values missing for 2 males.
[3] All figures are rounded off to 1 decimal place.

TABLE 5.5 PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF ENERGY BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Cereals and cereal products	36	36
Meat and meat products	16	14
Milk and milk products	9	12
Other food and beverages	10	9
Vegetables eg - potatoes	9	9
Oils and fats	8	7
Sugar and confectionary	4	4
Fruit	2	4
Fish products	3	2
Eggs and egg products	3	2

NOTE:- Other food and beverages - refer to soups, sauces, pickles and miscellaneous foods. Beverages - tea, coffee, spirits, wine, beer etc.

Cereals and cereal products contributed to over 35% of energy intake for both sexes, followed by meat & meat products, milk and milk products, other food and other beverages, vegetables - (especially potatoes) and oils and fats. The main sex difference revealed that males demand a higher proportion of energy intake from meats and meat products and females from milk and milk products(table 5.5).

PROTEIN INTAKE

The mean Protein intake for males and females is shown in tables 5.1 to 5.2. In 20 males (43%) and 28 females (58%) the proportion of energy derived from protein exceeded 17%. The majority of males and females had observed intakes substantially above the RNI value (table 5.6). Four males (9%) and four females (8%) had intakes twice the RNI value.

TABLE 5.6. PERCENTAGE DEVIATION OF MEAN PROTEIN INTAKES FROM THE UK DIETARY REFERENCE NUTRIENT INTAKES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (g/d)	53.3	46.5
Percentage equal to or above RNI value	94	96
Percentage of elderly whose intake was between 50-99% of the RNI value	6	4
Percentage less than 0.75g/kg/day	9	6
Percentage within +1 or -1(sd) of the mean	74	73

The dietary sources of protein are shown in table 5.7. The main sources were meat and meat products for both sexes, contributing over 30%, followed by cereals and cereal products, liquid milk, fish and fish products, food and other beverages and vegetables. Females derived a higher proportion of protein intake from food and beverages, fish and cheese than males. Daily average consumption of animal products is shown in table 5.26 and in (appendices A1 - A11) which contributes to a substantial source of protein. Consumption of meat alone was 142.1 g/d in males and 106.2 g/d in females.

TABLE 5.7. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF PROTEIN BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Meat and meat products	37	32
Cereal and cereal products	24	23
Liquid milk	10	8
Fish and fish products	9	9
Other food and beverages	5	9
Vegetables	7	7
Cheese and cheese products	3	5
Eggs and egg products	4	3
Dried milk, other milk and cream	1	3
Fruit	1	1

NOTE:- Other milk - refers to soured milks, butter milks, "complan", yogurts etc in all tables.

TOTAL CARBOHYDRATE, SUGAR AND FAT INTAKE

Tables 5.1 to 5.2 shows mean intake of carbohydrate, fat and sugar intake. The mean percentage of energy derived from carbohydrate fell slightly short of the proposed DRV's, the majority of males and females had intakes below this level. The proportion of energy derived from fat was greater than the DRV's in 74% males and 91% females (table 5.8). % Energy from Sugar was similar in both males and females - 17% (tables 5.1 and 5.2).

TABLE 5.8. DESCRIPTIVE DATA ON MEAN PERCENTAGE OF ENERGY FROM CARBOHYDRATE AND FAT FOR ELDERLY MALES AND FEMALES.

	TOTAL CHO		TOTALFAT	
	MALES	FEMALES	MALES	FEMALES
"N"	47	48	47	48
Dietary Reference Value (%)	47(50)	47(50)	33(35)	33(35)
Percentage Energy	44	43.4	36.4	38.4
Percentage within +1 or -1 (SD) of the mean.	74	73	68	75

TABLE 5.9. CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKES OF CARBOHYDRATE AND FAT BY ELDERLY MALES AND FEMALES.

	CARBOHYDRATES		FATS	
FOOD GROUP	MALES	FEMALES	MALES	FEMALES
	%	%	%	%
Cereals and cereal products	55	52	23	23
Meat and meat products	3	2	23	20
Butter, marg. other fats	-	-	21	17
Vegetables eg - potatoes	15	15	5	7
Other food and beverages	7	6	6	12
Sugar and confectionary	8	7	-	-
Fruit	5	8	-	1
Cheese and cheese products	-	-	4	7
Liquid milk	5	5	5	5
Eggs and egg products	-	-	6	4
Fish and fish products	-	-	4	3
Dried milk & other milk/cream	2	4	2	2

The dietary sources of carbohydrate and fat are given in table 5.9. Cereals and cereal products are the main sources of carbohydrate, over 50% for both sexes, followed by vegetables, sugar and confectionary, other food and beverages, fruit and liquid milk. Females derived a greater proportion of their carbohydrate from fruit than males. Daily consumption of bread (table 5.26) was greater in males 116.7g/d against 86.4g/d in females. The main sources of fat were cereals and cereal products, meat and meat products, butter, margarine and other fats and vegetables. Daily average consumption of fat e.g butter, margarine and other fats - 19.1 g/d in males and 15.7 g/d in females appeared to be lower than what one might of anticipated.

CALCIUM

The mean intakes of calcium (table 5.1 to 5.2) were on average above the RNI values. A wide scatter of values was found. Only 2 males (4%) and 1 female (2%) took less than LRNI of 400mg/d of calcium (table 5.10).

TABLE 5.10. PERCENTAGE DEVIATION OF MEAN CALCIUM INTAKES FROM THE UK DIETARY REFERENCE VALUES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	700	700
Percentage equal to or above RNI value	68	63
Percentage of elderly whose intakes was between 50 and 99% of the RNI value	28	35
Percentage less than 50%	4	2
Percentage less than LRNI	4	2
Percentage within +1 or -1 (SD)of the mean	72	79

The dietary sources of calcium are shown in table 5.11. Liquid milk, bread, cereal and cereal products, other food and beverages, cheese and cheese products were the main contributions to calcium intake. Males derived more calcium from liquid milk, cereal and cereal products and bread.

Daily average consumption of total milk and cream was 241.7 g/d males and 210.3 g/d females and cheese and cheese products 10.2 g/d and 16.0 g/d for males (table 5.26).

TABLE 5.11. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO MEAN DIETARY INTAKE OF CALCIUM BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
Liquid milk	35	29
Bread	15	11
Cereals and cereal products	14	12
Other food and beverages	9	12
Cheese and cheese products	8	12
Dried milk, other milk, cream	4	9
Vegetables	5	5
Fish and fish products	4	3
Meat and meat products	4	3
Fruit	2	2

IRON

The mean intakes of iron shown in tables 5.1 and 5.2 for males and females were above the RNI value. Of the 9% of males and 21% of the females whose intake was below the RNI, only 1 male (2.1%) had an intake less than 6.7 mg/d and all intakes were above the LRNI (table 5.12).

TABLE 5.12 . PERCENTAGE DEVIATION OF MEAN IRON INTAKES FROM THE UK DIETARY REFERENCE VALUES INTAKES BY ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	8.7	8.7
Percentage equal to or above the RNI	92	79
Percentage of elderly whose intake was between 50 and 99% of the RNI value	9	21
Percentage less than 50%	-	-
Percentage equal To LRNI	-	-
Percentage within +1 or -1(sd) of the mean	70	65

The main sources of iron were cereal and cereal products amounting to about 30% of total (table 5.13) in respect of which breakfast cereals as well as cakes and biscuits, especially fruit cake and digestive biscuits, were important contributors, followed by meat and meat products (mince in particular) bread, other food and beverages and vegetables. These individual food items were also important contributors of B vitamins. Actual daily average consumption of these individual food items are given in (appendices A1 - A11).

TABLE 5.13. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF IRON BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Cereals and cereal products	30	32
Meat and meat products	22	17
Bread	19	17
Other food and beverages	11	15
Vegetables	6	6
Fruit	2	5
Potatoes	6	5
Eggs and egg products	4	3
Liver	1	1

THIAMIN

TABLE 5.14. PERCENTAGE DEVIATION OF MEAN THIAMIN INTAKES FROM THE UK DIETARY REFERENCE NUTRIENT INTAKES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	0.9	0.8
Percentage equal to or above RNI Value	94	98
Percentage below LRNI (mg/1,000 Kcal)	-	-
Percentage within +1 or -1 (sd) of the mean	66	71

TABLE 5.15. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF THIAMIN BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Bread	22	18
Breakfast cereals, rice, pasta	17	16
Potatoes	17	15
Meat and meat products	15	13
Other food and beverages	7	12
Vegetables	7	8
Cakes, biscuits, puddings	5	8
Liquid milk	7	6
Fruit	3	4

The mean intakes of thiamin shown in tables 5.1 to 5.2 were above the RNI values (table 5.14). No subject took less than the LRNI value. The most important source of thiamin was bread, followed by breakfast cereals, rice, pasta, potatoes, meat and meat products, food and other beverages and vegetables (table 5.15).

RIBOFLAVIN

The mean intake for riboflavin (table 5.1 to 5.2) were above the RNI value (table 5.16). Roughly about a quarter of the males and females had intakes less than the RNI value, of which only a small percentage had intakes less than the LRNI. Principal food sources of riboflavin were liquid milk (over 20%) followed by from cakes, biscuits, puddings, meat and meat products and other food and beverages. One female with a high mean daily intake of Riboflavin (3.055 mg/d) consumed marmite, a rich food source of this nutrient.

TABLE 5.16. PERCENTAGE DEVIATION OF MEAN RIBOFLAVIN INTAKES FROM THE UK DIETARY REFERENCE VALUES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	1.3	1.1
Percentage equal to or above the RNI	79	81
Percentage of elderly whose intake was between 50 - 99% of the RNI value	19	19
Percentage less than 50%	2	-
Percentage less than LRNI	4	2
Percentage within +1 or -1 (sd) of the mean	70	69

TABLE 5.17. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF RIBOFLAVIN BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
Liquid milk	25	21
Cakes, biscuits and puddings	23	21
Meat and meat products	19	14
Other food and beverages	8	9
Dried milk, other milk, cream	3	7
Egg & egg products	5	5
Bread	5	4
Cheese and cheese products	2	4
Liver	3	4
Vegetables	4	4
Fruit	1	3
Marmite	-	2
Fish & other fish products	2	2

NICOTINIC ACID eq

The mean intakes were above the RNI values for both males and females (table 5.18). Meat and meat products, particularly chicken, mince, cereal and cereal products, bread, other food and beverages, especially tea and coffee and fish and fish products were the main contributors to this nutrient (table 5.19).

TABLE 5.18. PERCENTAGE DEVIATION OF MEAN NICOTINIC ACID eq INTAKES FROM THE UK DIETARY REFERENCE VALUES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	16	12
Percentage equal to or above the RNI	100	100
Percentage less than LRNI, NA ac eq/100	-	-
Percentage within +1 or -1 (sd) of the mean	66	71

TABLE 5.19. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO DAILY DIETARY INTAKE OF NA ACID eq FOR ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Meat and meat products	37	32
Cereals and cereal products eg. cakes, biscuits, puddings, breakfast cereals, rice, pasta	15	15
Bread	15	13
Other food and beverages	7	10
Fish and fish products	6	7
Liquid milk	6	5
Potatoes	5	5
Vegetables	3	3
Cheese and cheese products	2	3
Egg and egg products	3	2
Fruit	1	2
Dried milk, other milk and cream	1	2

VITAMIN C

The mean intake of vitamin C shown in tables 5.1 and 5.2 were above the RNI values for males and females. A wide scatter of values was found. Of the 19 males and 14 females who took less than the RNI value, only 1 male who was on a low calorie diet took less than 10 mg/d (table 5.20).

TABLE 5.20. PERCENTAGE DEVIATION OF MEAN VITAMIN C INTAKES FROM UK DIETARY REFERENCE VALUES INTAKE FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake (mg/d)	40	40
Percentage equal to or above the RNI	60	71
Percentage of elderly whose intake was between 50 - 99% of the RNI value	32	21
Percentage less than 50%	9	8
Percentage less than LRNI	2	-
Percentage within +1 or -1 (sd) of the mean	77	65

The main sources of vitamin C were green vegetables and tomatoes, raw citrus fruit, orange juice, potatoes and potato products and other raw fruit. There were some interesting sex differences - females derived a further 8% of the vitamin C from green vegetables and tomatoes and an extra 4% from orange juice than males. In comparison males derived more vitamin C from potatoes and potato products by 5% approx (table 5.21).

TABLE 5.21. PERCENTAGE CONTRIBUTION OF VARIOUS FOODS GROUPS TO DAILY DIETARY INTAKES OF VITAMIN C BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Green vegetables and tomatoes	17	25
Raw citrus fruit	17	20
Orange juice	15	19
Potatoes and potato products	18	14
Other raw fruit	11	10
Other food and beverages	12	6
Liquid milk	4	3
Pulses and mixed vegetables	5	3

VITAMIN A

The mean intakes for vitamin A are shown in tables 5.1 and 5.2. The magnitude of the standard deviations and frequency of the results did not typify that of a normal distribution for both sexes. This was mainly due to those subjects who consumed liver during the survey week who were at the top end of the distribution in calculated vitamin A. Of the 18 males and 25 females who had intakes below the RNI value only 2 females had intakes less than the LRNI, (table 5.22). The main sources of Vitamin A were liver, followed by pulses and mixed vegetables, fats and oils, liquid milk and cereals and cereal products (table 5.23).

TABLE 5.22. PERCENTAGE DEVIATION OF MEAN VITAMIN A INTAKES FROM UK DIETARY REFERENCE VALUES INTAKES FOR ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
"N"	47	48
Reference Nutrient Intake μq/d	700	600
Percentage equal to or above the RNI	38	50
Percentage of the elderly whose intake was between 50 - 99% of the RNI value	47	46
Percentage less than 50%	15	4
Percentage less than LRNI	6	4

TABLE 5.23. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUP TO DAILY DIETARY INTAKE OF VITAMIN A BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
Liver	27	34
Pulses and misc. veg - carrots & others	19	16
Fats & oils	19	14
Cereals & cereal products (biscuits/cakes/puddings).	5	6
Cheese and cheese products	4	6
Liquid milk	7	5
Eggs and egg products	5	5
Green vegetables & tomatoes	5	4
Other food & beverages	3	3
Meat and meat products	3	3
Fruit	1	3
Dried milk & other milk & cream	2	2
Cereals/cereals products (pasta, bread etc)	1	-

VITAMIN D

The mean vitamin D intakes for males and females are shown in table 5.1 and 5.2. Like vitamin A, a wide scatter was found and results did not represent that of a normal distribution. The findings show that only 5 males and 1 female took more vitamin D than 10 μg/d (table 5.24).

TABLE 5.24. PERCENTAGE DEVIATION OF THE MEAN VITAMIN D INTAKES FROM THE UK DIETARY REFERENCE VALUES FOR ELDERLY MALES AND FEMALES.

	MALES	FEMALES
"N"	47	48
Reference Nutrient Intake	Above 10 μg/d	Above 10 μg/d
Percentage equal to or above the RNI	11	2
Percentage of elderly whose intake was between 50 - 99% of the RNI value	6	8
Percentage less than 50%	83	90

The principal sources of vitamin D table 5.25 were fish and fish products, cereals and cereal product, oils and fats and egg and egg products. Males derived a greater proportion of vitamin D from fish and fish products than females. However the average daily consumption of fish was less in males 25.5 g/d and 32.1 g/d in females (table 5.26). Although males ate slightly less fish than females, a small percentage of males ate fatty fish eg. kipper, mackerel, which is a richer source of vitamin D (table 5.25). Females derived a greater proportion of vitamin D from cereals and cereal products and eggs.

TABLE 5.25. PERCENTAGE CONTRIBUTION OF VARIOUS FOOD GROUPS TO AVERAGE INTAKES OF VITAMIN D BY ELDERLY MALES AND FEMALES.

FOOD GROUP	MALES	FEMALES
	%	%
Cereals and cereal products	19	29
Fish and fish products	42	28
Oils and fats	24	22
Eggs and egg products	10	11
Other foods and beverages	5	10

TABLE 5.26.

AVERAGE DAILY CONSUMPTION OF FOOD GROUPS BY ELDERLY MALES AND FEMALES (G/D).

FOOD GROUP	MEN	WOMEN
MILK AND CREAM	241.7	210.3
CHEESE	10.2	16.0
MEAT	142.1	106.2
FISH	25.2	32.1
FATS	19.1	15.7
SUGAR & PRESERVES	21.8	9.8
VEGETABLES	240.3	226.2
FRUIT	108.9	144.1
BREAD	116.7	86.4
CEREALS	165.1	145.2

DISCUSSION

The results of the present study of energy and nutrients have been compared to the DH (1991) Dietary Reference Values. In taking this approach it must be understood the DRV are not synonymous with requirements as were the old recommended daily amounts by the DHSS (1979), (Gray, 1992). However, by calculating daily group means and percentages below the Reference Nutrient Intakes, we are thus able to assess the likely adequacy of the diet for this group of elderly males and females. For example, if the percentage below the RNI Value for a particular nutrient is zero, then we could suggest that the deficiency in the whole group is likely to be small. As the percentage increases further, then the risk of deficiency within the group is likely to increase. However, it is acknowledged that within this group there are individuals whose requirements may differ from that of the group. Indeed it may be possible for an individual even at the lower Reference Nutrient Intake level to meet their requirements, although this is highly improbable.

Reference has also been made where appropriate to three particular studies on the elderly - The Panel on Nutrition of the elderly (DHSS, 1972) and two studies from more closely comparable areas - the Glasgow Survey, (Macleod et al, 1974) and the Edinburgh Survey (Lonergran et al, 1975) which are of relevance. Due caution however, must be reserved when considering the results of the present study with these other studies as the significance of any differences in the results is uncertain due to sample size and methodologies used.

The results of energy, protein, fat and carbohydrate are given in tables 5.1 to 5.9. The findings in the present study for mean energy values are similar to those of the DHSS Survey, the Glasgow Survey and the Edinburgh Survey for females. However the results for the males are considerably lower.

There are several available estimates of what constitutes desirable energy in old age (Macleod, 1974). It is therefore useful to compare the descriptive data obtained from this supposedly healthy group of elderly males and females with the suggested literature values for energy intake.

The FAO/WHO/UNU (1985) suggest that adequate energy intake for a group should be at least 1.4 x BMR. This is their maintenance requirement and generally speaking would allow for about 3 hours of activity while standing, including washing and dressing. According to the FAO/WHO/UNU (1985) formula and using equations for estimating basal metabolic rate DH (1991), the mean energy intake for females which approximated 1.4 x BMR was likely to be adequate. However, mean energy intakes for males - 1.3 x BMR was below the suggested level. The percentage of subjects with E1/BMR less than 1.4 BMR was 69% for males and 49% for females. Only a small percentage , 17% of the males and 27% of the females had mean energy intakes which met or were greater than the most recent report by the DH (1991) which suggests a prescriptive value of 1.5 x BMR (EAR). Their rationale for setting energy requirements at this level was because many elderly people have such low levels of energy expenditure and intake that they are at risk of inadequate intake of certain nutrients and should therefore be encouraged to increase activity level in order to achieve higher energy intake and therefore nutrient intake.

It is interesting to find that low energy values - less than 1.2 x BMR were observed amongst individuals some of whom could be described as moderately obese and obese using Garrow's (1981) grades for obesity. In this context the following figures are relevant - 14 males (33%) of whom 5 were moderately obese and 3 obese all had intakes less than 1.2 x BMR. Seven females (16%) of whom 3 were moderately obese and 2 obese also had intakes of less than 1.2 x BMR. Energy intakes below 1.2 x BMR are associated with a population group who would be confined to bed all day and the provision of food that would

supply this amount of energy would only be seen as an emergency measure, as in the acute phase of famine relief and the body would progressively deteriorate at this level of intake. This was the level at which the 5th World Food Survey chose to define as their cut off point signifying the likelihood of malnutrition. The latter cases most definitely require some further explanation, in view of the "apparent health", of the subjects at the time of the study. However, it is acknowledged this statement is totally subjective and cannot be validated until full clinical examinations are carried out. Several other scientific papers on "healthy"elderly living in the Community both in the UK and elsewhere Lonergran et al (1975); Bunker et al (1984) and Decarli et al (1989) have reported low energy values. Great care is required in interpreting these values before decisions can be made as to the well being of individuals indeed Taylor (1968) implied that malnutrition is a widespread problem of the elderly.

Some explanation can be offered to suggest why six subjects had intakes of less than 1.2 x BMR. The 3 males and 3 females were all trying to lose weight, of which 1 male was following a self prescribed diet and the remaining subjects were following diets prescribed by the health centre dietitians or by their general practitioner. The descriptive data of these individuals has been included, however for reasons above their results have not been included in the mean values. In the remaining cases one can only speculate on reasons for the lower energy values. Durnin (1990) offers several possible explanations - sample size being too small for statistical analysis, population behaving in an abnormal way and consuming low quantities of food, BMR may be grossly inappropriate to the population group, although this is highly improbable as a value of 1.5 x BMR would only be reduced by 200 Kcal/d (0.8) MJ, or finally the methodology is faulty. It is be probable that the results which have been obtained are appropriate to the technique and that

they were a true reflection of energy intake levels at the time of the study. It is quite acceptable for the present study to report energy values of less than 1.2 x BMR provided it is realised that this is only a temporary situation and would have to be balanced by periods when energy intakes exceeds this level. Further investigation in the context of the present study would be valuable at a later stage to ascertain if these values indicate lower requirements on a risk of deficiency.

In the present study, mean protein intake was substantially above the RNI values and therefore likely to be adequate for the majority of elderly males and females. It is variously reported that the consumption of meat is very low in the elderly (Davidson et al, 1962) or conversely, that meat constitutes a large part of the diet of the elderly studied (Ohlson et al, 1948). The latter case seems particularly relevant to the present study where daily consumption of animal products and in particular meat was an important contributor to mean intakes of protein for both sexes. The mean intake values show reasonable agreement to those of the DHSS survey, the Glasgow survey and the Edinburgh Survey, except for females where mean intakes in the present study appear to be relatively high.

Recommendations for protein intake are usually based on nitrogen balance studies. However recent nitrogen balance studies have not, as yet provided definite results on the protein needs of the elderly (FAO/WHO/UNU,1985; Munro et al, 1987). The UK DRV's DH (1991) contain figures for protein based mainly on the FAO/WHO/UNU (1985) recommendations. On this basis 4 males and 3 females had intakes below the "safe" intake of protein, 0.75g/kg/day. Low energy values as suggested by the FAO/WHO/UNU (1985) formula were also observed for three individuals, although two of these males and one female were dieting at the time of the study. Further investigation

is thus required to reveal if these values indicate lower requirements or a risk of deficiency. By contrast four males and four females had protein intakes twice the RNI Value. The DH (1991) stated it is prudent for adults to avoid protein intakes of more than twice the RNI value as there is some evidence to suggest protein rich diets have associated health risks, chronic renal hyperfiltration and hyperfusion which contribute to the deterioration of ageing kidney's (Brenner et al, 1982).

Setting dietary reference values or guidelines for fat and carbohydrate represents a major departure from previous exercises. The figures that have been proposed for fat and carbohydrate represent judgements and should not be taken as firm recommendations, indeed if the guidelines were achieved, the arbitrary end points would be reached. The DH (1991) recommended a reduction of total fat intake to 33 (35) per cent of daily total energy intake as high fat particularly saturated fat intake is one of the factors associated with cornary heart disease and some forms of cancer. The DH (1991) also felt that although certain populations are able to survive low intakes of carbohydrate, there would be no harm in increasing carbohydrate to 47 (50) per cent of total daily energy intake to avoid fat, protein and alcohol providing a greater proportion to total food energy. According to these guidelines mean results for total fat 36.4 and 38.4 in males and females respectively were marginally above the DRV's. Our values are also much lower than those reported by the Glasgow Survey for this population age group and are more in line with the current guidelines. The mean figures for carbohydrate suggest that intake was slightly below the DRV guidelines and similar to those found in the Glasgow Survey already mentioned.

The present findings show there are some similarities in the distribution of food sources of energy, carbohydrate, fat and protein to the results of the DHSS Survey and the Glasgow Survey. Some interesting differences have emerged though. Fats and oils in the present study as a source of food for the above nutrients is considerably lower and meat and meat products as a source of protein is higher in males.

The group mean intake results for minerals e.g. calcium, iron and zinc would appear to suggest that they are likely to be adequate for the group of elderly males and females, except for selenium where mean intake fell below the LRNI value (Tables 5.1 to 5.13).

The optimal level of calcium intake for elderly people is the subject of continuing debate (British Nutrition Foundation, 1989). At present more research is needed to give data on which to base future recommendations. Our mean values are similar to those reported by the DHSS Survey and the Edinburgh Survey, although our figures are marginally lower for males. The results reveal that a small proportion 4% in males and 2% in females took less calcium than the LRNI of 400mg/d of which one male was on a low calorie diet. Low levels of calcium intake are associated with osteoporosis and bone fractures especially in the elderly females.

The results of vitamins are given in tables 5.1 to 5.25 and are best discussed separately. In theory, a reduction of physical activity could cause a shortage of B vitamins, although in practise a clinical deficiency is quite rare except in alcoholics (Shank, 1983) and where pathological conditions affect the gastrointestinal tract. The group mean intakes for males and females for thiamin, riboflavin and nicotinic acid eq show it was likely that mean intake was sufficient. Only in the case of riboflavin did a small proportion-2 males and 1 female have intakes less than the LRNI figure.

Low levels of vitamin C intake have been reported in a number of studies on the elderly (Burr et al, 1974; Vir and Love, 1979; Schorah et al, 1981; Newton et al, 1983; Mandal and Ray, 1986). However, despite the abnormality of vitamin C status reported by such studies, the evidence for an increased requirement in old age is not persuasive, (Newton et al, 1983; DHSS 1991b).

The results for vitamin C for males and females in the present study seem to suggest it is unlikely that this nutrient is inadequate for the group even when allowing for losses in cooking by an average of 10mg/d (Disselduff and Murphy, 1968). Indeed mean intake of this nutrient was considerably higher than those mean values found by the DHSS, the Glasgow Survey and the Edinburgh Survey primarily due to the high consumption of green vegetables and tomatoes, citrus fruit, orange juice and potatoes by both sexes. For many years it has been recognised that 10mg/d of vitamin C will prevent the development of scurvy in adult man. One male had an intake of less than 10mg/d. Low levels of vitamin C leads to abnormal collagen formation in connective tissue and may contribute to delayed healing in the elderly (Gray, 1992).

Vitamin A or retinol is not a widely distributed food. Animal sources contributed to nearly all the vitamin A (table 5.23) although pulses and vegetables - largely carrots provided 19% in males and 16% in females. The mean intake figures for both sexes were above the RNI figures for this nutrient and only 3 males and 2 females took less than the LRNI figures. However, it seems unlikely that dietary deficiency of vitamin A is an important problem in the elderly (Macleod et al, 1974) as the average old person's intake of vitamin A is more than adequate (Shephard, 1978).

The situation for vitamin D is quite different. There is evidence for the existence of widespread deficiency of this nutrient amongst old people (Exton Smith et al, 1966; McLennan et al, 1972). Low intakes of vitamin D were also found by the Glasgow Survey and Exton-Smith (1965) found that the diet of elderly Londoners provided only 2-3 μg of vitamin D per day. In many old people, where sunlight exposure is poor for example those with indoor lifes vitamin D status is also likely to be poor (Corless et al, 1979; Sheltawy et al 1984; Dattani et al, 1984). Indeed, lack of vitamin D diminishes the

absorption of calcium and this predisposes to osteomalacia (Nordin, 1980). The results of the present study would appear to suggest inadequate intake of mean vitamin D for males and females. A high proportion of elderly subjects had observed intakes below the dietary guideline of 10 μg/d of which 90% in females and 83% in males took less than 50% of the DRV. There are few good food sources which contain vitamin D. In light of the present findings it could be beneficial to this elderly group if margarine were a substitute for butter along with increased consumption of fatty fish and eggs.

THE LIMITATIONS OF THE STUDY

The importance of the study lies in the provision of descriptive data on the intake of energy and nutrients observed in a group of reasonably healthy elderly males and females living in their own homes. However, when considering the results of the present study the reader should keep in mind some of the limitations -

A five day weighed record was used for assessment of food consumption in the present study. No method has ever been devised for collecting completely reliable and comprehensive dietary information (DHSS, 1972; Cameron and van Staveren, 1988). Indeed, some of disadvantages of the weighed record have been well documented such as the co-operation from each subject and the very cumbersome weighing and recording of the method which may have a restricting effect of food intakes (Euronut-Seneca, 1991). The findings of the study also show a large range of intake values for most nutrients. Possible contributions are chance variation which might account for 50% or more of the difference in nutrient intake from one person to another in any one week, (Yudkin, 1951) or could be due to the inadequacies in the method used. In order to increase the reliability of this method daily visiting of subjects is necessary not only to try and avoid errors, but also to reassure over

anxious subjects (Durnin, 1990). It was also not possible to visit each subject daily due to the time constraints and this may have affected the results.

Nevertheless, despite the limitations in using this weighed dietary method, in theory this method is thought to be one of the most accurate ways of assessing food intake (Marr, 1971; Harkin, 1989). Certainly in the present study the weighing and recording of the food intake was easily understood, apart from in the case of 1 male who was too busy and 2 females - I of whom was too busy and the results of the other female could not be analysed. Both subjects dropped out after 1 day only. The dietary weighed method appeared not to inconvenience the participating subjects to any marked extent. Written instructions were kept brief and detailed information was gathered only after subjects had practised the technique. In order to increase the validity of the data, a 5 day record was kept, which included a weekend to allow for any changes in dietary patterns over a Saturday and Sunday. Calibrated digital scales with automatic zero with a 1 gramme accuracy easily read and operated were issued. Food records were analysed using food tables based on the Composition of Foods, 4th edition Paul and Southgate (1978) and up to date supplements were also used.

Interpretation of the results has been difficult because standards for evaluation are uncertain as observed by various authors notably Munro et al, (1987). The intakes of nutrients normally recommended for elderly people generally have been derived from limited assessments of the real needs of this group and often rely on extrapolation from younger adults. There is also a lack of recent data on healthy elderly living in their own homes to which comparisons can be made. Indeed Horwath (1989) in her review of international literature on representive groups of elderly found comparisons difficult, even when data was available due to the differences in study design, methodology and data interpretation.

CHAPTER 6

ACTIVITY AND ESTIMATED ENERGY EXPENDITURE

1. Each subject's self-perceived ability to perform activities of daily living as itemised by the general questionnaire is listed in table 6.1.

2. The mean duration of the group of elderly males and females performing various activities during each day of the experimental period as examined by the physical activity diaries is shown in table 6.2. Individual results are given in appendix B (detailed tables B1 - B12).

3. A summary of the group mean time mins/d elderly males and females spent performing leisure activities, household activities, outdoor activities and walking is given in table 6.3.

4. Percentages of subjects who reported taking part in various activities throughout the year and self perceived activity as examined by the general questionnaire is shown in table 6.4.

5. Self-perceived health of elderly subjects is shown in table 6.5.

6. Mean estimated energy expenditure values are given in table 6.6, correlated against body weight and observed energy intake. Individual results are shown in appendix B (detailed tables B13 - B14).

R E S U L T S

ACTIVITY PATTERNS

The activity diaries provided detailed information on the activity patterns of this group of elderly males and females over a period of 3 days which theoretically, should represent their "normal" routine patterns. Further descriptive data derived from the general questionnaire has provided a useful check on information reported in diaries and also provides further information on the year round activities, self-perceived physical activity and health of this elderly group. The following is a report of the results found.

ACTIVITIES OF DAILY LIVING

Each subject was asked 13 questions listed in table 6.1 about their ability to perform various activities of daily living, each subject then described their level of competence for each item using a 4 point scale ie (can do without difficulty/can do with difficulty but without help/ can do only with help/unable to do). The majority of elderly males and females who participated in the study reported that they were able to cope with most activities of daily living. Only a small minority of the subjects reported any great mobility difficulties - 2% of the males 4% of the females stated they were unable to carry a heavy shopping bag. Nearly all the participants said they could manage to do light housework, however when the ability to do heavy housework was questioned, this number fell abruptly especially amongst the females.

TABLE 6.1 ACTIVITIES OF DAILY LIVING OF ELDERLY MALES AND FEMALES

ACTIVITY	CATEGORY	MALES	FEMALES
"N"		47	48
To walk at least 400m		(%)	(%)
	1	92	90
	2	9	10
To use stairs	1	85	85
	2	15	15
To carry a heavy thing e.g. a shopping bag of 5kg for a hundred metres	1	72	48
	2	26	33
	3	-	15
	4	2	4
To use the lavatory	1	94	96
	2	6	4
	3	-	-
To wash and bathe yourself	1	100	96
	2	-	4
To dress and undress	1	100	98
	2	-	2
To go in and out of bed	1	100	98
	2	-	2
To cut toe nails	1	72	69
	2	6	6
	3	2	-
	4	19	25
To use the telephone	1	98	96
	2	2	4
To take own medication	1	100	100
	2	-	-
To manage finances	1	100	100
	2	-	-
To do light housework	1	98	98
	2	2	2
To do heavy housework	1	77	46
	2	15	21
	3	4	15
	4	4	19

NOTE: Subjects were asked to state which grade of difficulty best described their ability to perform those activities listed.

Categories 1 - Yes, without difficulty
2 - Yes, with difficulty but without help
3 - Yes, only with help
4 - No

TABLE 6.2

THE AVERAGE TIME THE GROUP OF ELDERLY MALES AND FEMALES SPENT PERFORMING VARIOUS ACTIVITIES PER DAY DURING THE EXPERIMENTAL PERIOD MIN/DAY AND AS A PERCENTAGE OF THE TOTAL - 24H/DAY

MEANS, STANDARD DEVIATIONS (PERCENTAGES)

ACTIVITY	MALES	FEMALES
"n"	44	47
In Bed	509.9 ± 56 (35)	517.0 ± 49 (36)
Sitting	466.7 ± 107 (32)	394.0 ± 103 (27)
Sitting Activities	24.9 ± 57 (2)	38 ± 47 (3)
Eating	98.0 ± 36 (7)	93.0 ± 26 (7)
Standing	13.3 ± 13 (1)	12.1 ± 12 (1)
Walking	55.4 ± 44 (4)	37 ± 25 (3)
Personal & Dressing	57.4 ± 22 (4)	74.0 ± 23 (5)
Housework	29.8 ± 40 (2)	73.2 ± 33 (5)
Kitchen Work	27.2 ± 23 (2)	53.0 ± 29 (4)
Food Preparation	39.8 ± 29 (3)	78.3 ± 26 (5)
Shopping	27.8 ± 23 (2)	37.2 ± 28 (3)
Occasional Work	5.8 ± 25 (-)	7.3 ± 31 (1)
Gardening	48.0 ± 64 (3)	17.4 ± 64 (1)
Swimming	1.6 ± 5 (-)	1.1 ± 4 (-)
Exercises	0.8 ± 4 (-)	0.8 ± 4 (-)
Car Cleaning	1.0 ± 6 (-)	0.3 ± 2 (-)
Car Repairs	3.3 ± 15 (-)	- (-)
Joinery	1.3 ± 5 (-)	- (-)
Bowling	20.4 ± 36 (1)	3.3 ± 14 (-)
Golf	3.8 ± 18 (-)	- (-)
Snooker	0.4 ± 3 (-)	0.8 ± 6 (-)
Yoga	1.3 ± 8 (-)	- (-)
Dancing	0.9 ± 6 (-)	1.4 ± 5 (-)
Building a Wall	2.4 ± 16 (-)	- (-)
Painting	- (-)	0.8 ± 6 (-)

TABLE 6.3

A SUMMARY OF THE GROUP MEAN TIME (MINS/DAY) ELDERLY MALES AND FEMALES SPENT PERFORMING VARIOUS PHYSICAL ACTIVITIES DURING THE EXPERIMENTAL PERIOD

ACTIVITY	MALES	FEMALES
	MINS/DAY (RANGE)	MINS/DAY (RANGE)
"N"	44	47
Leisure Activities [1]	30 (0 - 123)	8 (0 - 80)
Household Activities [2]	57 (0 - 194)	126 (17 - 212)
Outdoor Productive Activities [3]	55 (0 - 151)	18 (0 - 387)
Walking [4]	55 (0 - 183)	37 (6 - 143)

NOTE: [1] Leisure activities - includes those leisure pursuits performed in the home and away e.g. bowls, swimming, keep fit etc.

[2] Household activities - includes indoor activities such as housework, indoor home maintenance.

[3] Outdoor productive activities - includes gardening, outdoor house maintenance and car maintenance.

[4] Walking - any walking outside the home

All figures are rounded up to the nearest whole number.

Since the mean and median for activities such as housework and walking showed close comparison, either value was therefore applicable.

Housework	mean	median	Walking	mean	median
Males	30	35		55	50
Females	73	73		37	33

TABLE 6.4 RESULTS OF THE GENERAL QUESTIONNAIRE FOR REPORTED PARTICIPATION, TIME SPENT ON VARIOUS ACTIVIITES AND SELF-PERCEIVED ACTIVITY BY ELDERLY MALE AND FEMALES

		MALES	FEMALES
"N"		47	48
Work (%)			
Fulltime		-	-
Part Time		11	10
Housework (%)			
Doing light housework		38	98
Doing heavy housework		38	71
1 Time spent doing housework	≤ 0.30 (min/h/day) (%)	24	21
	≥ 1.00	48	51
	≥ 2.00	14	23
	≥ 3.00	-	4
LEISURE ACTIVITIES	(%)		
Taking part		53	33
Numbers of those frequently participating in leisure activities	("N")		
	Bowls		
	Swimming	17	6
	Golf	4	6
	Social Dancing	3	-
	Keep Fit	1	2
		-	2
No. months per year taking part in this activity	2 - 3 (%)	8	6
	3 - 4	4	25
	≥ 5	88	44
OTHER ACTIVITIES			
2 Gardening	(%)	68	44
Watching TV, Reading Radio	(%) >4/day	72	71
3 Community organisations	(%)	38	60
4 SELF PERCEIVED ACTIVITY			
Much less active		-	-
Less active		2	8
Average Active		38	52
More Active		55	29
Much more Active		4	10

NOTE: 1 Subjects were asked how long they spent on housework per day.
2 Refers to percentage who reported doing gardening.
3 Refers to participation levels in community organisations.
4 Subjects were asked if they considered themselves to be more or less active than others of their age.

TABLE 6.5 ASSESSMENT OF HEALTH AND SOCIAL CONTACTS SELF PERCEIVED HEALTH, ILLNESS, USE OF MEDICINES REPORTED BY ELDERLY MALES AND FEMALES

		MALES (%)	FEMALES (%)
"N"		47	48
SELF PERCEIVED HEALTH	- Very Poor	-	-
	Poor	-	2
	Fair	23	19
	Good	61	50
	Very Good	15	29
HAPPY AND CONTENTED WITH EVERY DAY LIFE	- No	-	-
	Yes now and then	6	15
	Yes most of the time	94	85
WELL ENOUGH TO DO WHAT YOU WANT TO DO	- No	-	-
	Yes now and then	15	10
	Yes most of the time	85	90
[1] COMPARATIVE HEALTH	- Worse	-	-
	About the same	40	52
	Better	60	48
[2] HEALTH PROBLEMS	- Lack of appetite	2	2
	Difficulties in breathing	30	23
	Tiredness	15	33
MEDICINES		51	63
[3] SMOKING	- Now	28	32
	Ever Smoked	79	60
SOCIAL CONTACT WITH CLOSE RELATIVES OR FRIENDS	- Never	-	-
	Rareley	9	4
	Monthly	11	6
	Weekly	60	60
	Daily	21	29

NOTE: [1] Elderly subjects were asked to compare their own health with other people of their own age.
[2] Elderly subjects were asked if they had any problems in relation to the mentioned categories.
[3] Elderly subjects were asked if they had ever smoked for at least 1 year.

LEISURE TIME ACTIVITIES

Leisure time activities which included those leisure pursuits performed in the home and away e.g. bowls, swimming, keep-fit etc were the least frequently reported physical activity in the diaries (appendices B1 - B12). Only 30% females and 46% males took part in this form of activity during the study period. Females spent less time on average in leisure activities, an average time of 8 mins/d against 30 mins/d for males (table 6.3). The females undertaking this activity participated in swimming 11% followed by dancing 11% of which 2 took part in dancing at a social club and 2 attended ballroom dancing and 1 keep fit classes. The remaining leisure activities the females took part in were 4% light exercises, bowling 6%, 2% played snooker and 2% painted.

The most frequently reported leisure activity the males took part in was bowling 30% with 16% playing for longer than 1 hour. 9% went swimming, 5% did light exercises, 2% practised yoga 2% went dancing at a social club 5% played a round of golf and 2% took part in snooker at the time of the experiment (appendices B1 - B12).

Analysis of the general questionnaire reveals that the leisure activity patterns reported by the elderly male and female subjects over a short period of 3 days were similar to the patterns reported throughout the year in terms of participation levels and types of leisure activities (table 6.4).

HOUSEHOLD ACTIVITIES

The results of the 3 day diaries show that while lower mean times and participation rates were recorded for leisure activities by females, a greater percentage of their time was spent on household activities 126 mins/d as compared to 57 mins/d for males (table 6.3). Every female participated in some form of housework ranging from 17 - 212 mins/d while 11% males reported

doing no housework during the experiment period, mainly because there was no necessity for them to participate as their wives did this work. Housework reported by the females mainly fell into light to moderate categories. The greatest proportion of their time was spent in general cleaning, dusting and hoovering 81%. 38% did laundry of which 6% hand washed, 49% made beds and 28% did the ironing. Only a small amount of heavy work was reported - 2% cleaned their back staircase and 2% cleaned and filled an aga stove. Males also spent the greatest proportion of time in light to medium categories - 48% cleaned, dusted and hoovered 2% ironed and 7% did laundry work. Very few engaged in heavy housework 2% removed kitchen tiles and laid a new floor, 5% moved furniture for decorators, 2% removed and cleaned all the double glazing in the flat and replaced the windows. The kitchen work for both males and females consisted of mainly light work such as general cleaning, washing and drying dishes 86% males and 96% females took part in these activities (appendices B1 - B12).

Similar household activity patterns to this were reported in the general questionnaire as being carried out throughout the year (table 6.4).

OUTDOOR PRODUCTIVE ACTIVITIES

Outdoor productive activities were more common amongst males 61% though 30% females also took part in this activity. In general the diaries show males spent over twice as long in outdoor activities compared to women - mean reported times 55 mins/d for males and 18 mins/d for females. The general questionnaire reported that 68% males and 44% females undertook gardening throughout the year (table 6.4). During the 3 days experimental period, gardening was the most frequently reported activity for both males and females accounting for 85% males and 97% females total outdoor activity time. The majority of gardening time for both sexes was spent in light gardening i.e.

weeding, potting plants, watering the garden and pruning hedges. 9% males and 2% females were moderately active, engaged in using electric lawnmowers during the study period. Only 5% males took part in heavy gardening i.e. digging for short periods of time, no females did heavy gardening. The remaining outdoor productive activities reported by 2% females and 2% males was car cleaning. 7% males worked on their cars, this could be classified as light activity as it consisted of nothing over strenuous i.e. cleaning oil stick, checking water levels. 7% males partook in light joinery work and 2% spent time building a small wall in the back garden (appendices B1 - B12).

WALKING

The diaries revealed that 96% males and 100% females walked during the study period. On average the group of males spent longer walking than females, 55 mins/d against 37 mins/d respectively (table 6.3). There was a wide range in recorded times for walking by both sexes 6-143 mins/d for males and 0-183 mins/d for females. The majority of time spent walking could be described as purposeful i.e. to the shops, bowling club, church etc. 27% males and 43% females spend less than 30 minutes walking a day during the study period. The longest times recorded for walking during the experimental period were by 16% males who took long leisurely walks which were stated to be part of their weekly routine. 1 male and 1 female also walked their dogs for long periods (appendices B1 - B12).

Time spent shopping was excluded from walking time. Women spent a greater proportion of the study period shopping, 37 mins/d against 28 mins/d for males (table 6.2).

SEDENTARY ACTIVITIES

Time spent on sedentary activities - sitting or sitting activities eg watching TV, playing cards, eating and lying in bed accounted for the greatest proportion of reported time. On average 1,100 mins/d for males and 1,042 mins/d for females of which 510 mins/d for males and 517 mins/d for females involved lying in bed (table 6.2). When time spent for lying in bed is excluded, only 1 female spent more time participating in other activities than sitting (appendices B7 - B12).

WORK ACTIVITIES

A small percentage of the elderly males and females reported doing work activity in the general questionnaire consisting of part-time work throughout the year (table 6.4). The diaries indicate during the study period 7% males and 6% females undertook work activity of a part-time nature. 1 man had a printing business in his own home and used a hand operated printer which involved considerable periods of the day standing 11% of his total time per day. 1 man worked as a regular bar man at a local bowling club which took up 7% of his time during the study period and 1 man spent a small proportion of his time doing book-keeping 2% his time a day. Two of the females participated in voluntary work for the local hospital, taking up 11% and 3% of their time and 1 female worked as a sales assistant in a newsagent taking up 11% of her time on average per day (appendices B1 - B12).

SELF-PERCEIVED PHYSICAL ACTIVITY AND HEALTH

Each subject was asked about their self-perceived physical activity, health and social contacts (table 6.4 and 6.5). Interestingly, 59% males and 39% females considered themselves to be "more active" to "much more active" than others of their own age. A small percentage of elderly males 2% and 8%

females considered themselves as "less active". The 5 females who considered themselves to be "much more active" had an estimated physical activity level equal to or greater than 1.5. Of the 2 males who considered themselves to be "much more active", both had estimated PAL's equal to 1.4.

76% males and 79% females judged their health to be good to very good. Only 2% female considered herself to be in poor health. The majority of males and females also reported that they were happy and contented with their everyday life and were well enough to do what they wanted to do most of the time. However, when subjects were asked to compare their own health with others of their own age, subjects were more cautious in their response - 40% males and 52% females described their health as being the same as others of their own age.

DISCUSSION

PHYSICAL ACTIVITY PATTERNS

The purpose of this chapter is to describe the patterns of activity observed amongst this elderly group. Certainly, the results seem to conform to the expected patterns of customary physical activity within an elderly population group and comparable to the findings of two British studies - Dallosso et al (1988) and the General Household Survey (1985).

Generally speaking the majority of elderly males and females who participated in the study could be described as inactive as shown by their activity diaries which described patterns mainly of light activity. Only a few subjects spent a small proportion of their time in any physical activity more strenuous than walking. By contrast, it is interesting to find that 59% of the male participants and 39% of the female participants considered themselves to be "more active" to "much more active" than others of their own age. Several authors, notably Sidney and Shephard (1977a) and Shephard (1978) have commented on the discrepancy between actual and self-perceived physical

activity. At present, despite frequent studies of self-perceived physical activity in children and middle aged males, much less is known about the attitude of the elderly person and more data is therefore required.

Females spent a greater proportion of their time in household activity than males and for both sexes, time spent in this activity was mainly in the light to medium categories. Very few engaged in heavy household activity. This pattern is also demonstrated in outdoor productive activities where most subjects reported activity of light to medium intensity only. Some authors have suggested that low participation rates in activities of high intensity may reflect levels of physical incapacity in the elderly. Certainly, in the context of the present study, there is no reason to suggest this as the majority of elderly males and females appeared to enjoy reasonably good functional ability and mobility. This does not help to explain why 27% males and 43% females spent less than ½ hour/day walking as shown in the activity diaries, yet only 3 males and 4 females reported any mobility difficulties although they could still manage to walk without help. Thus, there must be other factors which effect the elderly person's participation in activities of high intensity. Perhaps it could be due to "mental conditioning" of what society expects of an elderly person or there may be little need to perform such activities on a regular basis.

Very few subjects participated in leisure activities although more males than females took part in this form of activity. This finding is similar to the General Household Survey (1985) which found low participation rates in leisure activities in Great Britain with the exception of teenagers. At all ages, the value of simple walking should not be underestimated in contributing to good physical and psychological health. In the context of the present study the majority of elderly subjects reported some walking during the experimental period although mainly amounted to less than 1 hour a day. However a greater

percentage of males, 32% spent longer than 1 hour a day walking in comparison to 11% of females.

The largest proportion of this groups time/day was spent on sedentary activities. Although The World Health Organisations energy requirements assume 4-6 hours of sitting per day, according to the results of the present study for both males and females, this figure would appear to be rather conservative and incorrect. Indeed, 8-9 hours would seem to be a more realistic figure to include time spent sitting, doing sitting activities such as eating, knitting etc. Sidney and Shephard (1977c) also found the World Health Organisations figures conservative, based on their research on a group of Canadian Senior Citizens where 7-8 hours allocated to sitting was more appropriate. Thus, it would appear there is a need for more research to be done in this area.

Indeed, there is only limited recent data on the activity patterns of the elderly with which we can compare the present findings. Dallosso et al (1988) studied 507 subjects aged 65-75 years old in Great Britain and Euronut - Seneca (1991) studied 2,586 subjects aged 74-79 years old living in 19 towns and cities throughout Europe, in both studies the elderly living in their own homes. However, even though this data is available, differences in activity assessment methods, sample procedures and results have made comparisons extremely difficult.

Dallosso et al (1988) reported low customary levels of activity. Mean times spent on outdoor productive activities shown in hours/week were 7.4h males and 2.4h females; on indoor productive activities i.e. housework, males 4.9h and females 10.1h; on leisure activities males 3.6h and females 1.8h and on walking minutes/day, males 54.4 min/d and females 54.8 min/d. The physical activities most frequently participated in were indoor activities, walking,

outdoor productive activities and finally leisure activities, a finding which shows satisfactory comparison with the present study.

In the study by Euronut Seneca (1991) most of the elderly engaged in physical activity. The mean time spent on housework ranged from 1.9 to 3.6h/day; sports activities ranged from 0.5 to 4.6h/week and on leisure time activities which included walking and gardening ranged from 1.4 to 2.4h/week. In accordance with the results of the present study, housework was more common amongst females than males, sports ie leisure activities were reported more often by males and males spent a longer time in sports activities. Low participation rates in activities of high intensity were also reported Dallosso et al (1988) and Euronut Seneca (1991). With respect to work activity both the Euronut Seneca study and the present study considered this area. Analysis of the data revealed a difference in the numbers of elderly persons participating in work activity of a full time or part time nature. In some European towns a high percentage of elderly were still undertaking work activity with more males than females having a job. Full or part time employment ranged from 3 to 42% in males and 0 to 12% in females, In the present study, a small percentage 7% in males and 6% in females reported doing work of a part time nature during the experimental period.

RELIABILITY OF THE DATA

As stated previously, one of the purposes of the study was to describe the activity patterns found in this group of elderly people using the standard diary technique during 3 consecutive days. This permitted an estimate of daily energy expenditure and its relationship to total calorie intake and body weight is shown in table 6.6. Individual results are given in appendices (B13-B14) for both sexes.

TABLE 6.6

MEAN VALUES WITH STANDARD DEVIATIONS AND RANGES OF DAILY ENERGY INTAKE AND ESTIMATED ENERGY EXPENDITURE

SUBJECTS	"N"	WEIGHT (KG)	INTAKE	EXPENDITURE	MEAN % CALORIE BALANCE(1)
MALES	41	73.5 (11.0)	1986 (334.4)[2]	2231 (235.3)	89%
		(53.6 - 100.0)	(1332 - 2943)	1814 - 2794)	
FEMALES	44	64.7 (10.3)	1735 (235.0)[2]	1813 (163.9)	96%
		(40.4 - 102.5)	1326 - 2353)	(1511 - 2369)	

TE: [1] Calorie Balance - Mean intake expressed as a percentage of expenditure.
[2] Mean Values of 3 males and 3 females not included as they were on weight reducing diets and 1 female and 3 males who only took part in weighed food record.

The percentage difference between the group values for intake and expenditure was 11% for males and 4% for females. The results indicate that there was considerable variability within individuals. Statistical analysis indicates that the correlation coefficient between energy intake and energy expenditure was 0.44 + 0.26 in males and females respectively. There was a low correlation between body weight and energy intake 0.34 in males and 0.27 in females. On the other hand a general trend was observed between energy expenditure and body weight 0.71 in males and 0.60 in females.

The results confirm the observations of others concerning the individual variations between energy intake and energy expenditure over a short period of time (Durnin, 1961; Harries et al 1962). An explanation has already been suggested to explain the large differences in intake and expenditure of 6 individuals who were on weight reducing diets, see chapter 5. Further differences may be due to limitations of the study which are examined in chapter 5 and below -

Principles for recording activity patterns and estimating energy expenditure in the elderly are much as in a younger person (Shephard, 1977b; Laporte et al 1985). However, in practice, most techniques are more difficult to apply

to the elderly than to a young adult. The use of the standard diary technique may be hampered by several possible sources of errors -

(1) Subjects failure to keep their records correctly. This could be due to weakness of recent memory, poor eyesight, arthritic hands etc. and any attempts by the interviewer to verify dubious entries may founder due to a faulty hearing aid or garrulous responses to simple questions.

(2) It is virtually impossible to be sure of the minute accuracy of such records and any movement occurring for less than 1 minute cannot be recorded. This becomes a problem when the subject makes movements which occur frequently and irregularly e.g. getting out of a chair to switch the television on. Such movements can demand a considerable momentary increase in energy expenditure, but of very short duration.

(3) Errors occur when subjects digress from their "normal" routine.

(4) Lack of interest in the study by the subject.

Some of these errors are extremely difficult to detect, especially when the experiment is carried out in the subject's own home. Unless a group of subjects are living together in an institution, the cost and time involved in direct observation of movement patterns would be prohibitive. In the present study, great care was taken to minimise such errors by carefully explaining to each subject the purpose of the study, the need for accuracy in recording activities and the necessity of maintaining "normal" routine during the experimental period. The diaries given to the subjects were kept to a simple format where only a coded letter had to be inserted in the box to describe each activity in order to minimise the work of each subject. Only

3 of the subjects failed to keep their diaries. Generally speaking most of the subjects were highly motivated and conscientious and this is shown by the high standard of accuracy with which the group as a whole kept their diaries. For example, one man accurately kept his diary and provided extra pages of information on the day's events - the names of the television programmes he watched, the names of the people he spoke to, what he danced to at the local bowling club social event, each dance being timed to the minute and also with whom he danced!

Durnin and Weir (1954), Booyens and McCance (1957), Durnin and Namyslowski (1958) have demonstrated that there is considerable individual variation in the energy cost of every day activities. In order to improve the accuracy of information on physical activity, actual measurements on the oxygen consumption of each subject must be made during each of the various activities engaged in during the experimental period. However, Passmore and Durnin (1958), Brochetter (1958), Durnin and Passmore (1967) have suggested that energy expenditure of individuals can be estimated with a reasonable degree of accuracy using the published data on the energy costs of specific activities provided that the amount of time on these activities is known. It is therefore recognised that the standard activity diary technique provides detailed information on each subject's activity patterns and an approximate estimate of energy expenditure and this was the approach adopted by this study.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

The study has been conducted to explore and provide much needed data on the diet, activity patterns and anthropometry of an "apparently" healthy elderly group of males and females aged between 70 - 71 years old, living in their own homes in the medium sized town of Paisley, Scotland. In addition, data has also been collected on the food consumption and food habits of this group as this will have undoubtedly affected nutrient and energy intakes and in turn the overall nutritional status. By use of a general questionnaire, further information on socio-economic situation, lifestyle, health, self-perceived health, activity and diet habits was obtained and main results were summarised in the text. Further supplementary information is available by permission of the author.

In considering the results of the present study, one should bear in mind some of the limitations as previously discussed in the appropriate chapters. The general conclusions drawn from the investigation and further points that should be highlighted are as follows:-

The results from the data on the anthropometry indicate that females weighed less and had a smaller waist circumference. On the other hand, thicker mean triceps, biceps skinfolds and percentage of body fat was observed in females than in males. Similar mean circumference values were found for upper arm, calf and buttocks for both sexes. Overweight (BMI 25-30) was common among both sexes, 60% males and 69% females and the incidence of 'obesity' BMI (> 30) was present in 13% males and 10% females of which 2% females were grossly obese, BMI (>40). According to several authors, there is substantial evidence to suggest that BMI of 30 or higher is associated with risks to health. However, the significance of the finding concerning moderate obesity

within the elderly population remains unclear and could possibly be associated as a sign of good health. By contrast, low BMI (< 20) was observed in 2% males and 6% females indicating low fat reserves. Nevertheless, any claims concerning malnutrition cannot be substantiated in the context of the present study and would require further investigation although it can be concluded that low BMI does indicate a reduced capability of responding to nutritional emergencies and therefore not a desirable state.

The following are the general conclusions that can be drawn from the food intake investigation. As expected, a wide range of energy and nutrient intakes were observed. The daily group mean energy intake value which approximated 1.3 x BMR for males and 1.4 x BMR for females were below the desirable prescriptive value of 1.5 x BMR suggested by the DH (1991). A more realistic value might be at 1.4 x BMR, 31% of males and 51% of females obtained intakes equal to or greater than 1.4 x BMR. Below this level 21% of males and 16% of females had intakes equal to 1.3 x BMR. It could be possible to sustain this level with low levels of activity as reported. By contrast 14% of males and 18% of females had energy intakes equal to 1.2 x BMR with a further 33% of males and 16% of females with intakes of less than 1.2 x BMR. It is interesting to find amongst this "apparently" healthy group of elderly males and females reported energy intake values of less than 1.2 x BMR. It is possible that such intakes were true at the time of the study. However, on a physiological basis it could be concluded that it is unlikely these values would represent the habitual requirements of healthy elderly individuals and at low energy intake levels there is a greater risk of deficiency from some nutrients.

According to the DH (1991) suggested values for protein, calcium, iron, zinc, thiamin, riboflavin, nicotinic acid eq, vitamin C and A, mean daily intakes were above the reference nutrient intakes (RNI) values and are therefore likely to be satisfactory for the majority of the group. Mean fat intake was more in accordance to the new dietary guidelines. However, mean daily intakes of selenium and vitamin D fell below the suggested DH (1991) (RNI) values and indeed were below the lower reference nutrient intake value (LRNI) which could possibly represent a greater risk of deficiency of these nutrients within the group. Mean daily percentage of energy from carbohydrate fell marginally short of DH (1991) desirable level.

There are several general conclusions that can be drawn from the examination of the physical activity patterns amongst this group. Firstly, most of the elderly could be described as inactive as suggested by the physical activity diaries which revealed patterns mainly of light activity. Secondly, the mean time per day spent in physical activity reported in the diaries was similar for males and females, however there were important sex differences observed. Males spent a longer time in outdoor productive activities, walking and leisure activities than females, whereas females spent a longer time in housework activities per day. Thirdly, most of the elderly engaged in only physical activity of light-medium intensity, very few engaged in heavy physical activity despite good self perceived functioning, mobility, health and physical activity being recorded by the general questionnaire. Therefore, it can be concluded there might be other reasons in preventing this elderly group from taking part in activities of high intensity which should be investigated further.

The strength of the present study has been in providing a profile of the diet, physical activity and anthropometry observed in a group of elderly males and females living in their own homes. The following is a brief list of the proposed recommendations of the study.

1. A follow up longitudinal study of these subjects after a period of 5 years and then possibly after 10 years is recommended. This would be advantageous as it would help to increase our knowledge of what happens to people when they grow older. We particularly need to know about changes in weight, nutritional status, anthropometry, health and morbidity etc. with age.

2. It would also be useful to study subjects whose mean energy intakes fell below 1.2 X BMR and to study their food and nutrient intake over a period of time by at least one repeat study.

3. It is recommended that further studies which would link anthropometric variables with functional tests, e.g. an exercise test to further relate dietary intakes and physical activity with nutritional status, health and function should be carried out as discussed in chapter 3.

4. Remaining active for as long as possible in order to increase total energy expenditure and thus encourage higher energy intake would generally be recommended as a means towards good health in old age.

Finally, it must be concluded that there is a great deal of work still to be done on the nutrition of old people with a view to establishing standards of "normality" amongst the elderly and to help towards establishing an adequate nutritional policy for the elderly in the future. However, this will not be an easy task due to the heterogeneous nature of this population group.

APPENDICES

APPENDIX A

DETAILED TABLES - A1 - A11

- A12 - A18

DETAILED GRAPHS - A19 - A30

TABLE - A1

Average daily consumption of individual foods for Elderly Males and Females.

	FEMALES		MALES	
	Consumption (g/d)	Percentage of Females consuming each type of food during survey week	Consumption (g/d)	Percentage of Males consuming each type of during survey week
Milk and Cream		(%)		(%)
Liquid Whole Milk	42.1	23	55.5	30
Semi\Other Skimmed Milk	144.8	77	169.1	74
Other Milk	9.1	13	7.6	4
Evaporated Milk	1.4	4	1.4	4
Dried Milk	0.6	2	0.3	13
Cream - Single	1.0	13	2.0	13
- Double	0.8	10	0.5	6
Yogurt	10.5	38	5.3	13
Total Milk and Cream	210.3	96	241.7	100
Cheese				
Cheese-Natural				
Cheddar\Cheddar Type	11.3	71	7.3	55
Other UK\Foreign	-	-	0.7	9
Edam\Continental	1.2	8	-	-
Natural Soft	1.8	13	0.3	4
Processed	1.7	8	1.9	11
Total Cheese	16	85	10.2	62
Meat & Meat Products				
Carcase Meat				
Beef & Veal (1)	32.7	71	47.3	77
Mutton & Lamb (1)	6.7	23	9.4	26
Pork (1)	5.0	10	3.0	13
Total Carcase Meat	44.4	81	59.7	85

TABLE - A2

	FEMALES		MALES	
	Consumption	%	Consumption	%
Other Meat & Meat Products				
Liver (2)	1.6	8	1.2	4
Offal, Other than liver	0.9	6	1.9	13
Bacon & Ham cooked inc. canned (2)	14.2	67	12.9	62
Cooked Poultry	18.4	54	21.4	60
Corned Meat	3.2	21	1.6	11
Other cooked Meat, not canned	-	-	2.1	6
Other canned Meat, canned Meat Products	0.5	6	2.6	6
Sausages, Pork cooked	0.3	8	-	-
Sausages, Beef cooked	5.9	31	13.7	53
Meat Pies and Sausage Rolls - Ready to eat (2)	8.0	9	16.9	32
Convenience Meat or Convenience Meat Products (3)	8.1	5	8.0	15
Other Meat Products (3)	0.7	4	0.1	4
TOTAL OTHER MEAT\MEAT PRODUCTS	61.8	94	82.4	98
TOTAL MEAT AND MEAT PRODUCTS	106.2	98	142.1	100
FISH				
White, filleted, fresh, cooked	13.2	46	11.4	4.5
Fat, fresh, cooked exc,	5.0	15	-	-
Herring	4.1	6	1.2	6
White, processed, cooked	0.7	6	6.6	23
Fat, processed, unfilleted, cooked	1.4	2	1.3	6
Shellfish	0.2	2	0.1	2
Canned Salmon	2.5	10	1.6	9
Other canned or bottled Fish	1.7	15	2.5	15
Convenience Fish Products, cooked	3.3	6	0.5	2
TOTAL FISH	32.1	77	25.2	75

TABLE - A3

	FEMALES		MALES	
	CONSUMPTION	%	CONSUMPTION	%
Eggs and Egg Products	20.6	63	27.5	70
Fats				
Butters	7.1	58	6.8	60
Margarines	7.4	65	11.8	70
Vegetable & Salad Oils	1.2	8	0.5	9
TOTAL FATS	15.7	96	19.1	91
Sugars & Preserves				
Sugar	2.3	27	11.1	49
Jams, Jellies, and Fruit Curds	3.3	27	4.7	43
Marmalade	2.6	27	5.7	45
Syrup, Treacle	-	-	-	-
Honey	1.6	19	0.3	4
TOTAL SUGAR & PRESERVES	9.8	63	21.8	85
Vegetables				
Old Potatoes, cooked	83.6	94	93.4	83
New Potatoes, cooked	5.0	13	8.9	17
TOTAL FRESH POTATOES	88.6	96	102.3	91
Cabbages, fresh, cooked	14.4	27	7.0	30
Brussel Sprouts, fresh, cooked	3.8	19	1.2	4
Cauliflower, fresh, cooked	11.0	31	0.3	28
Leafy Salads, fresh	6.7	46	9.9	60
Peas, fresh, cooked	1.7	4	0.9	2
Beans, fresh	-	-	0.6	9
Other fresh Green Vegetables	6.3	27	5.5	38
TOTAL FRESH GREEN VEGETABLES	43.9	85	25.4	83

Note:- In some case some individual took both foods

TABLE -A4

	FEMALES		MALES	
	Consumption	%	Consumption	%
Vegetables (contd.)				
Carrots, fresh	5.4	52	9.6	49
Turnips and Swedes, fresh	3.8	15	4.9	13
Other Root Vegetables	1.1	4	8.6	17
Onions, Shallots, Leeks, fresh	4.5	44	6.2	43
Cucumber, fresh	1.5	19	-	-
Mushrooms, fresh	1.9	19	1.1	15
Tomatoes, fresh	10.4	56	20.6	70
Misc. fresh Vegetables	3.7	21	-	-
TOTAL OTHER FRESH VEGETABLES	32.3	90	51.0	91
Tomatoes, canned or bottled	0.5	2	0.2	4
Canned Peas	2.5	19	3.3	17
Canned Beans	7.0	31	5.2	28
Canned Vegetables, Other than Pulses, Potatoes or Tomatoes	19.6	27	14.9	30
Dried Pulses	1.4	8	0.6	4
Vegetable Juice	3.4	4	-	-
Chips, excluding frozen	1.3	4	13.7	19
Instant Potatoes	1.6	2	0.6	2
Canned Potato	-	-	1.7	4
Crisps and Other Potato Products	2.4	27	1.0	9
Other Vegetable Products	0.9	6	-	-
Frozen Peas	2.7	19	3.3	19
Frozen Beans	-	-	0.8	2
Frozen Chips or other frozen convenience Potato Products	15.8	44	12.7	28
All frozen Veg. anf Frozen Veg Products not specified elsewhere	2.3	8	3.6	9
TOTAL PROCESSED VEGETABLES	61.4	79	61.6	87
TOTAL VEGETABLES	226.2	100	240.3	100

TABLE -A5

	FEMALES		MALES	
	Consumption	%	Consumption	%
Fruit				
Fresh:				
Oranges	13.4	23	8.7	13
Other Citrus Fruit	8.2	25	11.7	19
Apples	19.7	40	13.2	30
Pears	7.9	19	2.7	8
Stoned Fruit	2.1	2	4.5	13
Grapes	1.7	6	1.0	2
Soft Fruit, other than Grapes	4.7	10	5.5	29
Bananas	23.0	58	16.7	45
Other Fresh Fruit	8.6	21	-	-
TOTAL FRESH FRUIT	89.3	85	63.8	85
Canned Peaches, Pears & Pineapples	0.04	10	5.1	26
Other canned or bottled Fruit	18.2	35	8.2	28
Dried Fruit and Dried Fruit Products	1.5	25	0.8	9
Frozen Fruit and Frozen Fruit Products	0.2	2	-	-
Nuts and Nut Products	1.1	10	0.8	6
Fruit Juices	33.8	42	30.2	28
TOTAL OTHER FRUIT AND FRUIT PRODUCTS	54.8	71	45.1	55
TOTAL FRUIT	144.1	96	108.8	91

TABLE - A6

	FEMALES		MALES	
	Consumption	%	Consumption	%
Cereals				
White Bread	34.1	77	55.5	81
Brown Bread	26.1	54	23.7	40
Wholewheat and Wholemeal Bread	12.4	35	15.5	23
Other Bread (4)	13.8	60	22.0	70
TOTAL BREAD	86.4	100	116.7	100
Buns, Scones and Tea Cakes	12.0	35	6.9	34
Cakes and Pastries	20.6	73	19.7	53
Crispbread	2.8	42	0.3	6
Biscuits, other than Chocolate	8.9	94	21.8	85
Chocolate Biscuits	4.3	56	7.7	53
Oatmeal Products e.g. Porridge	48.6	29	49.2	32
Breakfast Cereals	18.6	67	18.3	68
Milk Puddings	3.9	8	6.6	15
Other Puddings	9.9	17	12.1	26
Rice	4.1	21	3.5	11
Frozen convenience cereal foods (1)	1.6	21	6.9	13
Cereal convenience foods including Canned not specified elsewhere	1.6	17	12.0	38
Other cereals	8.3	17	-	
TOTAL CEREALS	145.2	100	165.1	100
Tea infusion	468.0	79	535.8	89
Coffee infusion	88.9	48	89.5	36
Concentrated soft drinks	0.1	2	1.1	9
Unconcentrated soft drinks inc. carbonated	10.6	35	27.5	22
Alcohol	25.0	42	119.5	36
Spirits	1.0	10	18.6	19
Branded food drinks, made up	3.2	6	7.6	19
Fruit Juice	33.8	42	30.2	28
TOTAL BEVERAGES	630.6	100	829.8	100

TABLE - A7

	FEMALES		MALES	
	Consumption	%	Consumption	%
Miscellaneous				
Soups, canned or packet	29.1	46	23.2	21
Soups, homemade	33.8	73	35.8	32
Spreads and Dressings	0.1	2	1.2	15
Pickles and Table Sauces	1.7	31	1.7	28
Meat and Yeast extract	0.5	17	-	-
Table Jellies, Squares and Crystals	0.7	2	3.2	11
Ice Cream, Mousse	6.8	31	8.7	38
Pouring Sauces, Sweet & Savoury	9.0	40	7.0	26
Accelerated Freeze Dried Foods	0.3	19	1.0	26
Confectionery - Sweets	1.0	8	0.5	11
- Chocolates	5.7	35	1.3	15
TOTAL MISCELLANEOUS	88.7	80	83.6	80

(1) See supplementary Classification

TABLE - A8

(1) Supplementary classifications.

		FEMALES	MALES
		Consumption	Consumption
Carcase Meat			
Beef:	Joints (inc. sides on bone)	0.9	
	Joints boned	4.0	4.6
	Steak, less expensive varieties	5.2	16.0
	Steak, more expensive varieties	6.4	4.8
	Minced	16.1	21.9
	Other, and Veal	0.1	-
TOTAL BEEF AND VEAL		32.7	47.3
Mutton			
Lamb:	Joints (inc. sides)	-	1.2
	Chops	5.6	6.1
	All other	1.1	2.1
TOTAL MUTTON AND LAMB		6.7	9.4
Pork			
	Joints (inc. sides)	1.6	1.0
	Chops	3.4	2.0
	Fillets and Steaks	-	-
	All other	-	-
TOTAL PORK		5.0	3.0

TABLE - A9

(2) Supplementary Classifications

	FEMALES	MALES
	Consumption	Consumption
Other Meat & Meat Products		
Liver: Ox	1.4	0.9
Lambs	0.2	0.3
Pigs	-	-
Other	-	-
TOTAL LIVER	1.6	1.2
Bacon & Ham: Cooked		
Joints (including sides & Steaks)	11.1	5.6
Rashers (vacuum packed)	1.8	6.7
Rashers (not vacuum packed)	1.3	0.6
TOTAL BACON & HAM COOKED	14.2	12.9
Poultry: Cooked		
Chicken	17.2	19.2
Turkey	1.2	2.2
All other	-	-
TOTAL COOKED POULTRY	18.4	21.4
Other Meat & Meat Products		
Meat Pies & Sausage Rolls:		
Ready to eat: Meat Pies	7.0	16.9
Sausage Rolls	1.0	-
TOTAL MEAT PIES & SAUSAGE ROLLS READY TO EAT	8.0	16.9

TABLE - A10

(3) Supplementary Classifications

	FEMALES	MALES
	Consumption	Consumption
Convenience Meats or Frozen Convenience Meat Products:		
Burgers	5.0	3.8
Other	3.1	4.2
TOTAL CONVENIENCE MEATS OR FROZEN CONVENIENCE MEAT PRODUCTS	8.1	8.0
Other Meat Products:		
Meat Pastes and Spreads	0.7	0.1
TOTAL OTHER MEAT PRODUCTS	0.7	0.1

TABLE - A11

(4) Supplementary Classifications

	FEMALES	MALES
	Consumption	Consumption
Other Breads -		
Rolls	10.6	18.3
Malt Bread and Fruit Bread	1.5	3.1
Vienna and French Bread	1.1	0.6
Other	0.6	0.0
TOTAL BREAD	13.8	22.0
Frozen Convenience Cereal Foods		
Cakes and Pastries	1.6	2.7
Other	1.6	4.2
TOTAL	3.2	6.9

TABLE A12

TOTAL PERCENTAGE OF MALE AND FEMALE CONSUMERS AT EACH MEAL OCCASION

SEX	MALES		FEMALES	
MEAL OCCASION	"N"	PERCENTAGE	"N"	PERCENTAGE
BREAKFAST	46	98	48	100
COOKED BREAKFAST[1]	23	49	19	40
LUNCH	44	94	48	100
COOKED LUNCH	33	70	40	83
EVENING MEAL	47	100	48	100
COOKED MEAL	47	100	48	100
SNACKS	47	100	46	96

NOTE [1] INCLUDES SUBJECTS EATING PORRIDGE

TABLE A13

TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
BREAKFAST CEREALS	74	2	-	9	81	-	-	-
BREAD & ROLLS	89	75	57	49	67	90	56	42
DIETARY BREAD, CRISPBREADS & ROLLS	-	2	2	2	21	15	2	6
PRESERVES - JAMS/HONEY/MARMALADE	33	11	23	30	38	17	23	23
SWEET & SAVOURY SPREADS	-	-	-	-	-	2	-	4
FISH & MEAT PASTES	-	-	-	2	-	2	-	2
EGGS	30	28	32	-	23	38	23	-
CHEESE	4	43	19	15	17	63	27	13
BUTTER	17	25	19	17	27	38	13	23
MARGARINE	48	34	32	28	38	46	29	33
PACKET SOUPS	-	2	4	2	-	13	8	-
CANNED SOUPS	-	7	6	-	-	17	8	-
HOME MADE SOUPS	-	34	21	-	-	50	23	-

TABLE A14

TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
FISH								
FRESH/SMOKED FISH	-	-	45	-	-	8	54	-
FROZEN & PREPARED FISH & FISH PROD	-	2	36	-	-	6	15	-
CANNED FISH	4	7	11	4	-	10	8	-
CATEGORY OF MEAT/PRODUCTS								
POULTRY	-	21	38	9	2	10	48	-
BEEF	9	50	75	-	-	29	67	-
LAMB/MUTTON	-	16	17	-	-	10	19	-
PORK	-	5	11	-	-	8	13	-
HAM/BACON MEATS	13	27	32	4	4	50	27	-
UNSPECIFIED MEATS	-	18	-	-	2	13	-	-
TYPE OF MEAT DISH/PRODUCT								
SAUSAGES	9	30	13	-	-	13	19	-
PREPARED PATÉ	-	-	2	-	-	2	-	-
COMPLETE DISHES/CONVENIENCE MEALS	-	7	19	-	-	13	23	-
CARRY HOME FOODS	-	-	2	-	-	-	-	-

TABLE A15

TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
TYPE OF MEAT DISH/PRODUCT (CONT'D)								
COLD MEATS/MEAT PRODUCTS	2	46	40	13	2	44	35	-
COLD MEAT PIES	-	-	4	-	-	-	2	-
HOT MEALS E.G. ROASTS, PORK CHOPS	-	21	49	-	-	19	44	-
CANNED MEAT LOAF	-	-	9	-	-	13	17	-
HOME MADE CASSEROLES, SAVOURY DISHES & PIE FILLINGS	-	18	40	-	-	10	56	-
HOT MEAT PIES & PUDDINGS	-	18	21	-	-	8	8	-
OTHER PREPARED HOT SAVOURY DISHES	-	-	-	-	-	2	-	-
FRESH SEED VEGETABLES	4	-	-	2	-	19	27	-
FRESH POTATOES	-	21	70	-	-	21	75	-
FRESH ROOT VEG (NOT POTATOES)	2	18	51	-	-	33	58	-
FRESH LEAF VEGETABLES	-	7	11	4	-	-	15	-
SALAD VEG FRESH & PREPARED	4	36	55	-	-	21	29	4

TABLE A16

TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
PREPARED VEGETABLES	2	14	60	-	-	13	60	-
PREPARED POTATOES	7	18	51	-	-	21	44	-
CANNED TOMATOES	-	5	-	-	-	-	2	-
RICE	-	-	9	-	-	-	15	-
HOME MADE OR BOUGHT PASTA DISHES	-	2	11	-	-	4	4	-
CANNED PASTA & RISOTTO	-	7	2	-	-	-	6	-
BAKED BEANS & VARIATIONS	2	7	11	-	-	8	15	-
TABLE SAUCES & DRESSINGS	2	16	13	-	-	10	27	-
SAUCES STUFFINGS & SAV. ADDITIVES	-	2	19	-	-	10	-	-
PICKLES & CHUTNEYS	-	16	19	2	-	6	10	-
MEAT & VEG EXTRACTS & GRAVY PRODS.	-	7	19	-	-	-	-	-
YOGURTS & FRESH CREAM DESSERTS	-	21	21	-	-	21	29	-
ICE CREAM & MOUSSE	-	7	21	13	-	4	25	2

TABLE A17

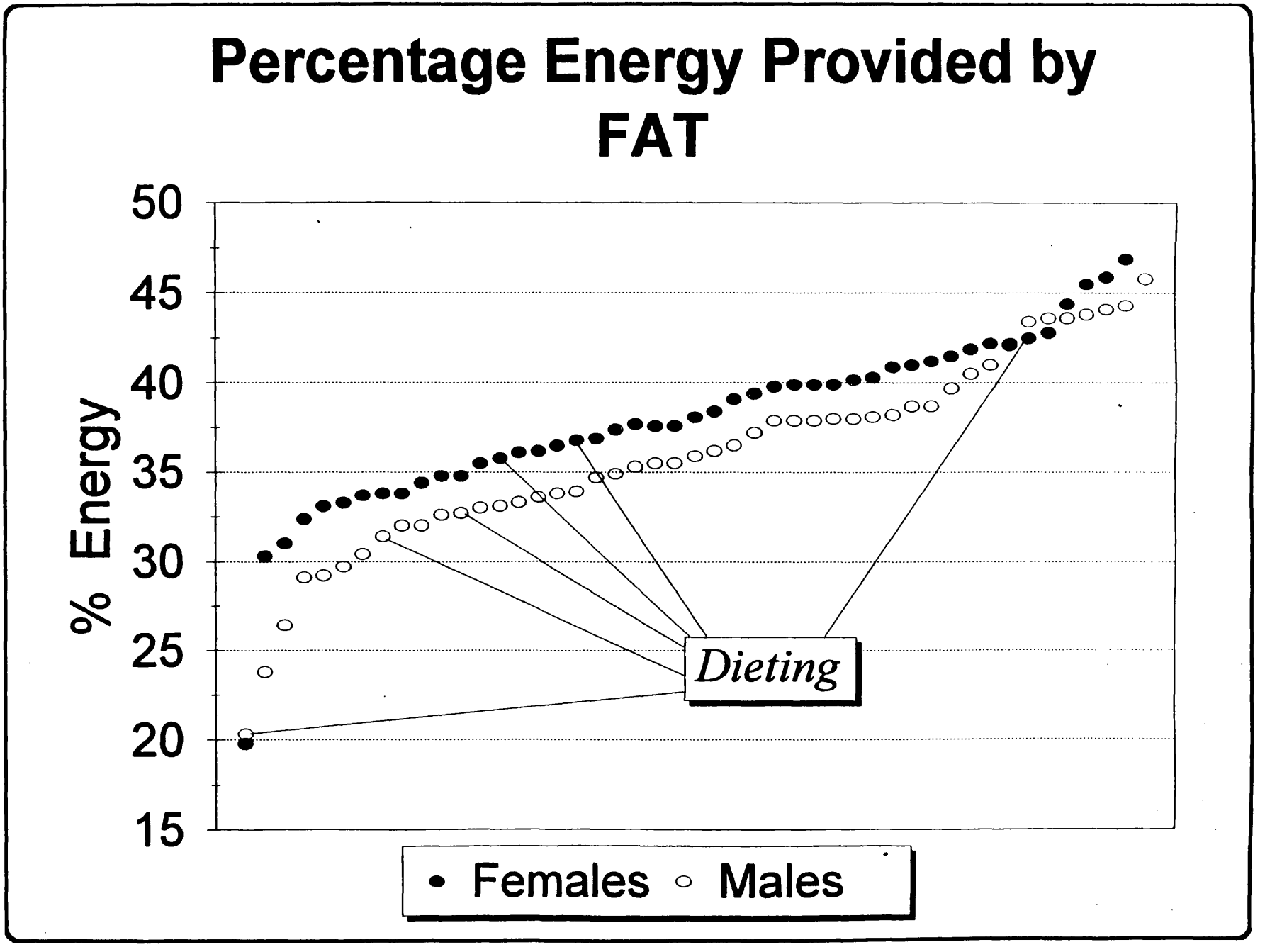
TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

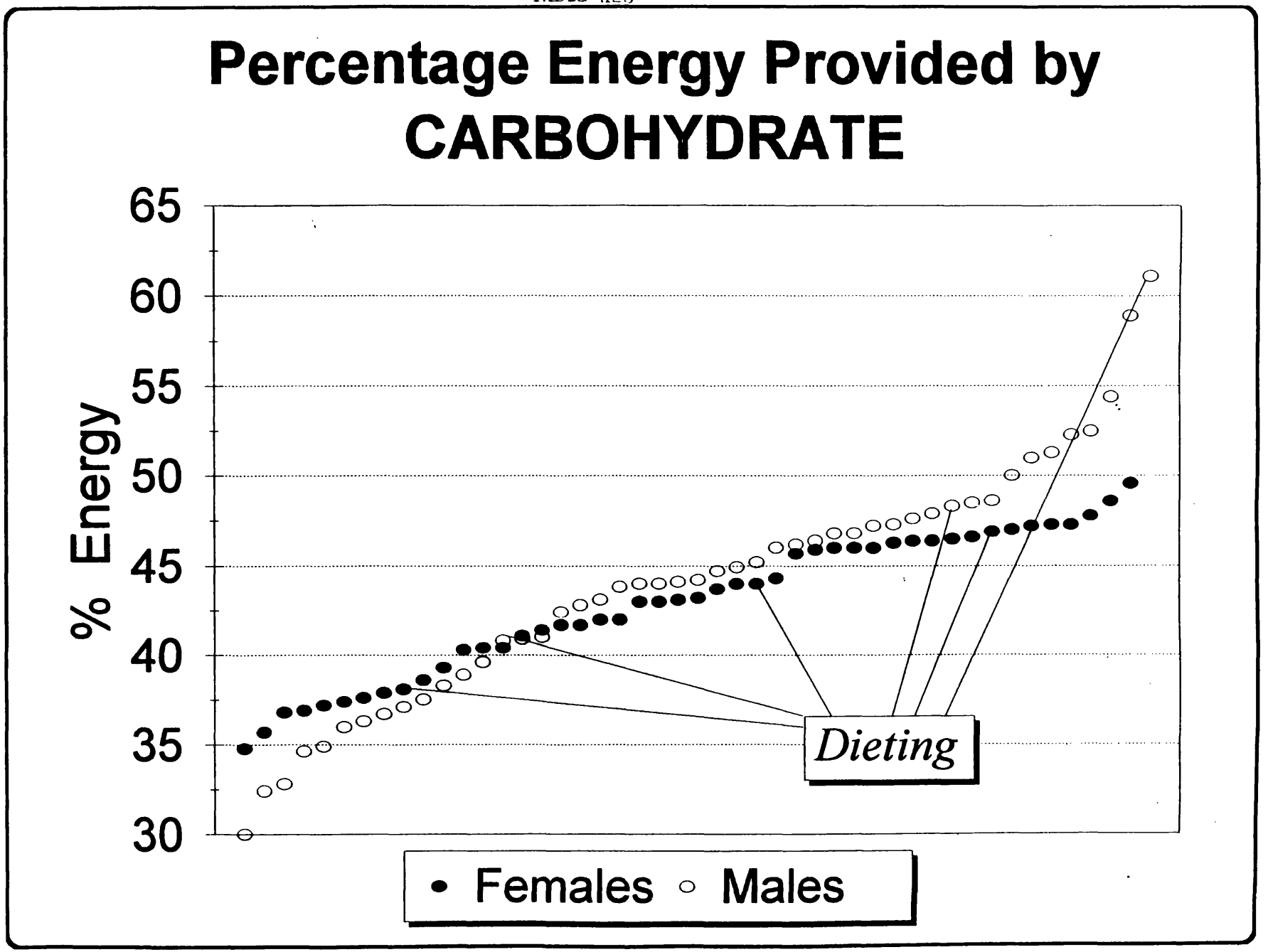
	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
JELLIES	-	-	11	-	-	-	2	-
CUSTARDS	-	11	9	-	-	2	8	-
DESSERTS & TOPPINGS	-	5	6	-	-	-	4	-
MILK PUDDINGS	-	2	13	-	-	4	8	-
STEAMED & BAKED PUDDINGS	-	5	11	-	-	6	2	-
SWEET PIE FILLINGS	-	2	9	-	-	4	6	-
OTHER PREPARED SWEET DISHES	-	-	2	2	-	6	4	4
TINNED & VACUUM FRUITS	4	11	28	-	13	8	15	-
FRESH FRUITS	28	52	32	21	40	69	40	31
DRIED FRUITS	4	5	-	-	15	4	6	-
PACKET MIXES/FROZEN PASTRY	-	5	-	-	-	-	-	-
CAKES, TARTS & PASTRIES	-	27	49	45	6	31	38	50

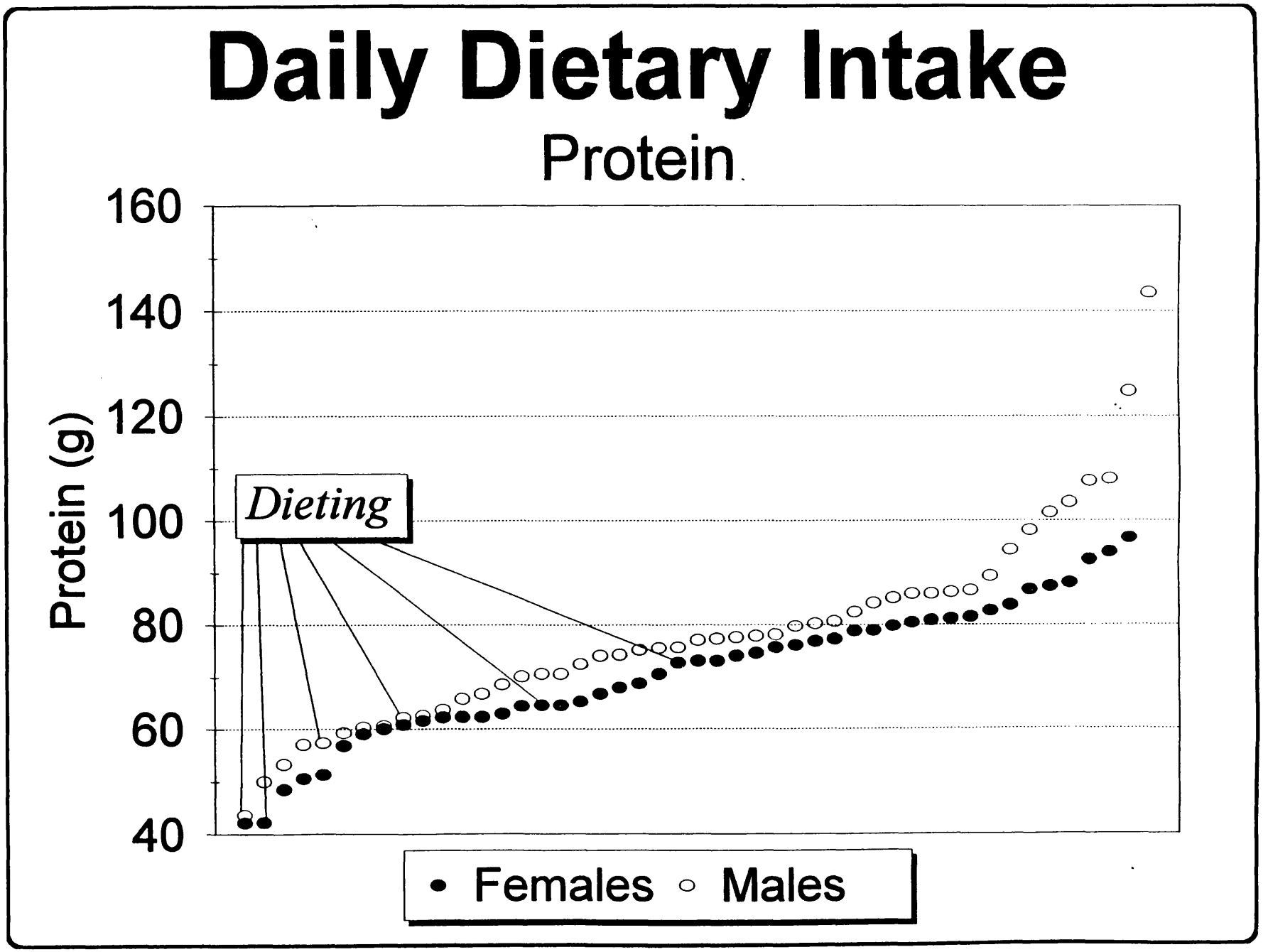
TABLE A18

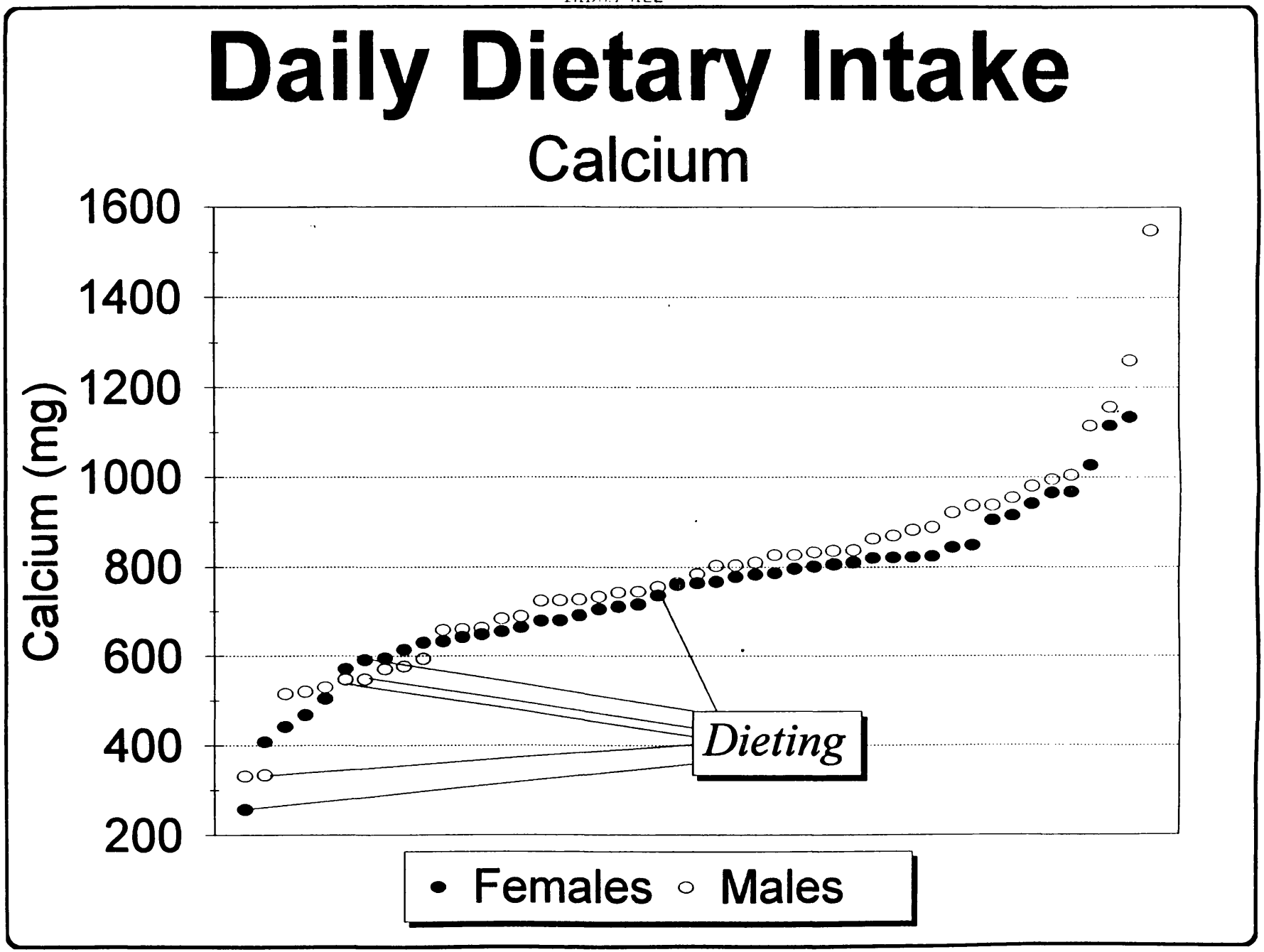
TOTAL PERCENTAGE OF ELDERLY MALES AND FEMALES CONSUMING INDIVIDUAL FOOD ITEMS AT SEPARATE MEAL OCCASIONS

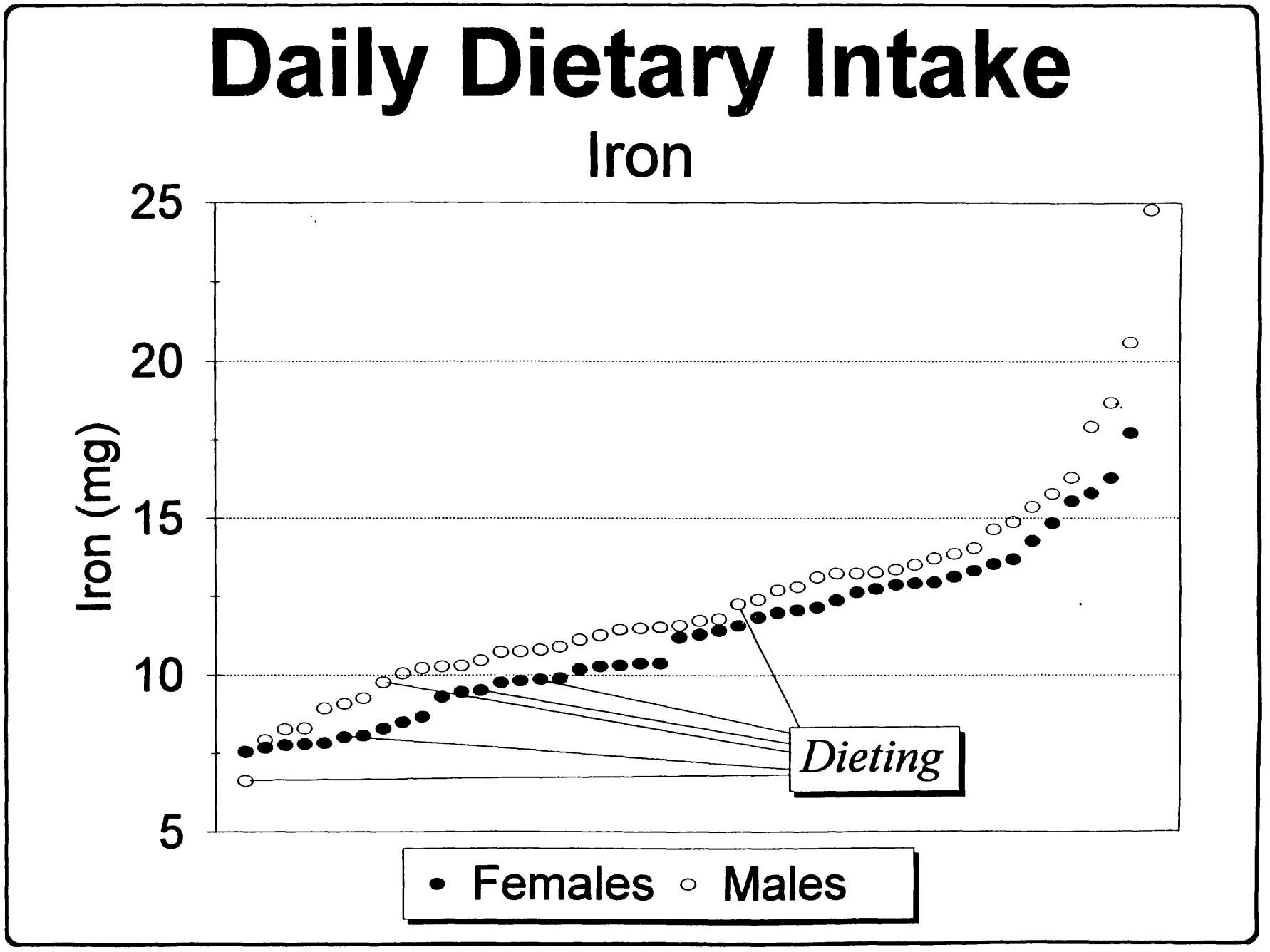
	MALES				FEMALES			
	BREAKFAST	LUNCH	EVENING MEAL	SNACK	BREAKFAST	LUNCH	EVENING MEAL	SNACK
PLAIN/SAVOURY BISCUITS	4	23	13	28	13	19	15	25
SEMI-SWEET BISCUITS	2	9	13	17	2	4	6	40
SWEET BISCUITS	-	9	6	28	-	23	19	31
CHOCOLATE COATED BISCUITS	-	5	6	32	-	17	13	29
CRISPS, NUTS & SNACKS	-	2	4	15	2	19	8	35
CHOCOLATE & SWEETS	-	-	-	4	-	-	8	-
SOYA BEAN PRODUCTS	-	-	-	-	-	-	-	-
FROZEN FRUITS	-	-	-	-	-	-	-	-
TEA	78	75	77	68	65	77	73	65
TEA WITH MILK	78	75	77	68	65	77	73	65
COFFEE	22	23	15	47	15	27	21	50
COFFEE WITH MILK	17	21	13	47	13	27	19	50
FRUIT JUICE/SOFT DRINKS	15	7	13	15	35	17	21	23
ALCOHOL	-	2	21	36	-	10	19	21
MILK DRINKS	-	5	17	15	-	-	6	23

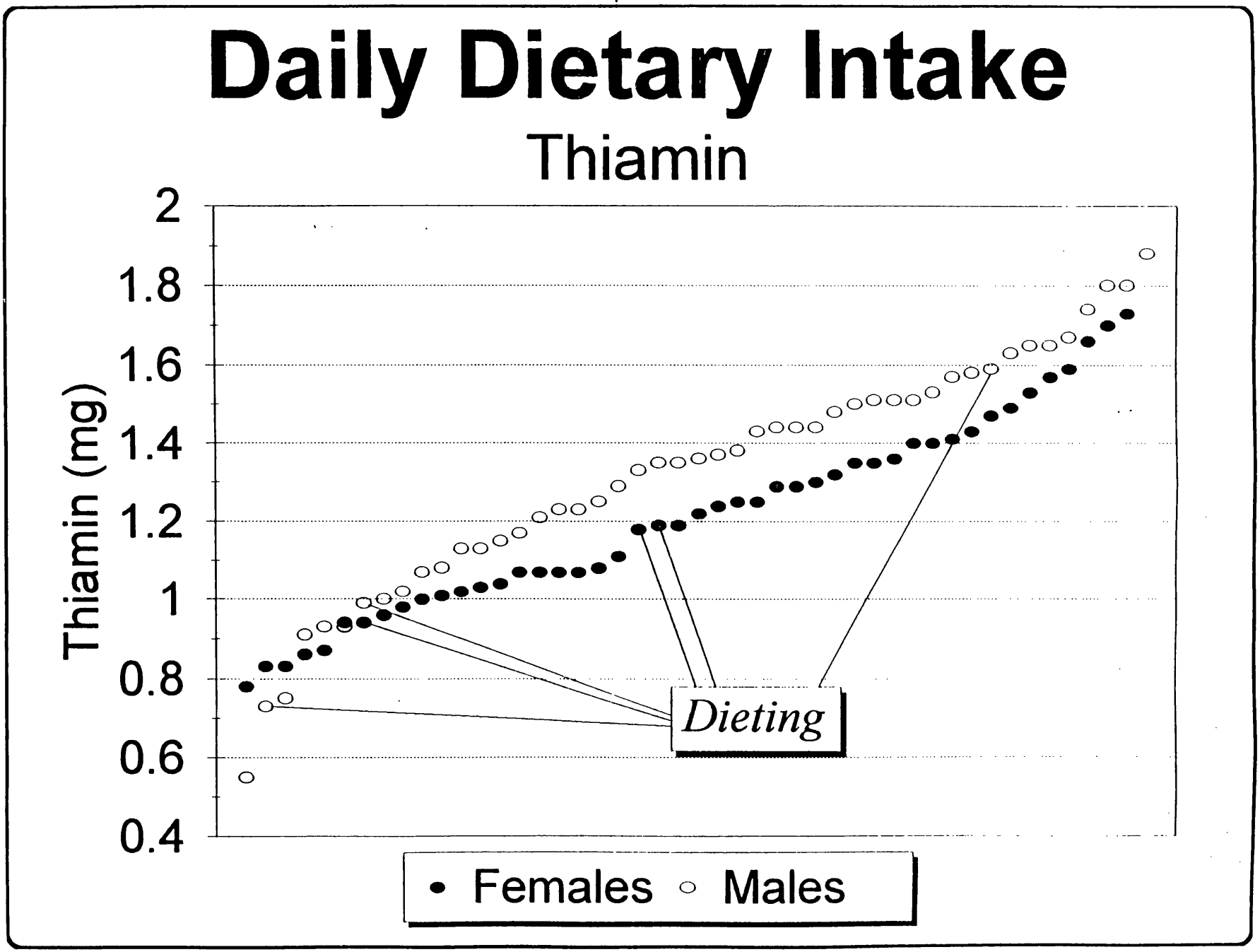

Percentage Energy Provided by FAT
% Energy
50
45
40
35
30
25
20
15
Dieting
Females
Males

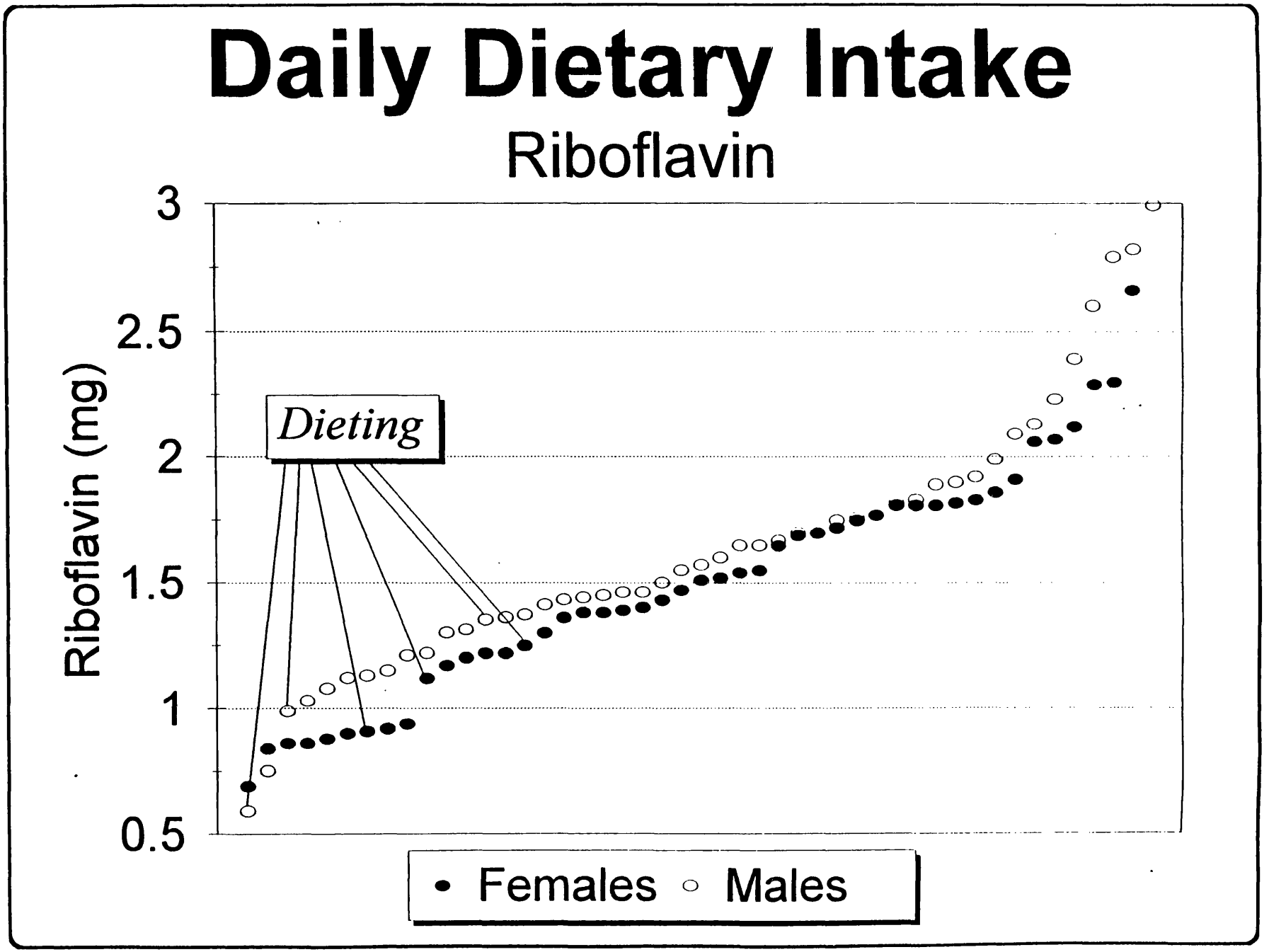

Percentage Energy Provided by CARBOHYDRATE
% Energy
65
60
55
50
45
40
35
30
Dieting
Females
Males

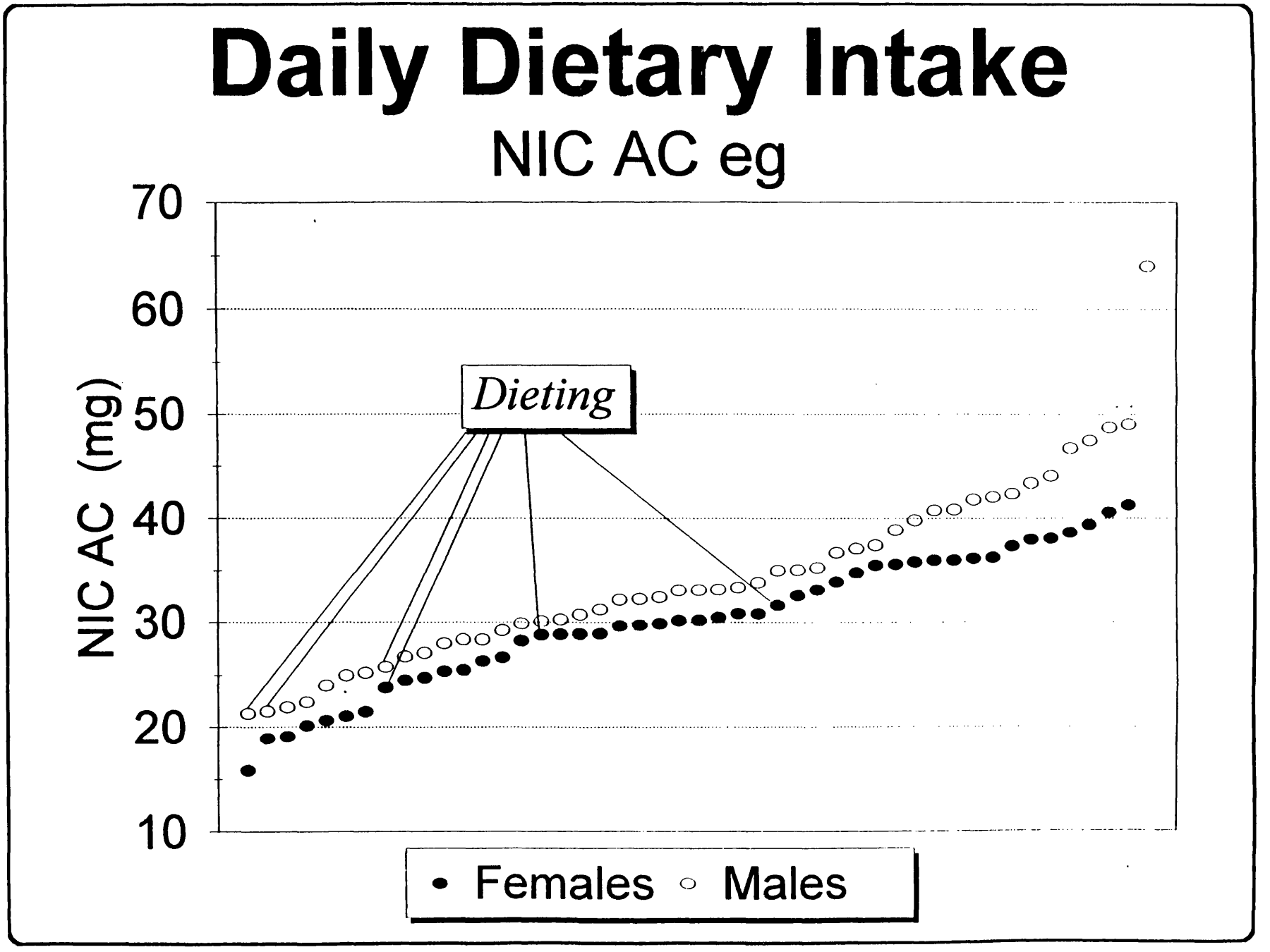

Daily Dietary Intake
Protein
160
140
120
100
80
60
40
Protein (g)
Dieting
Females
Males

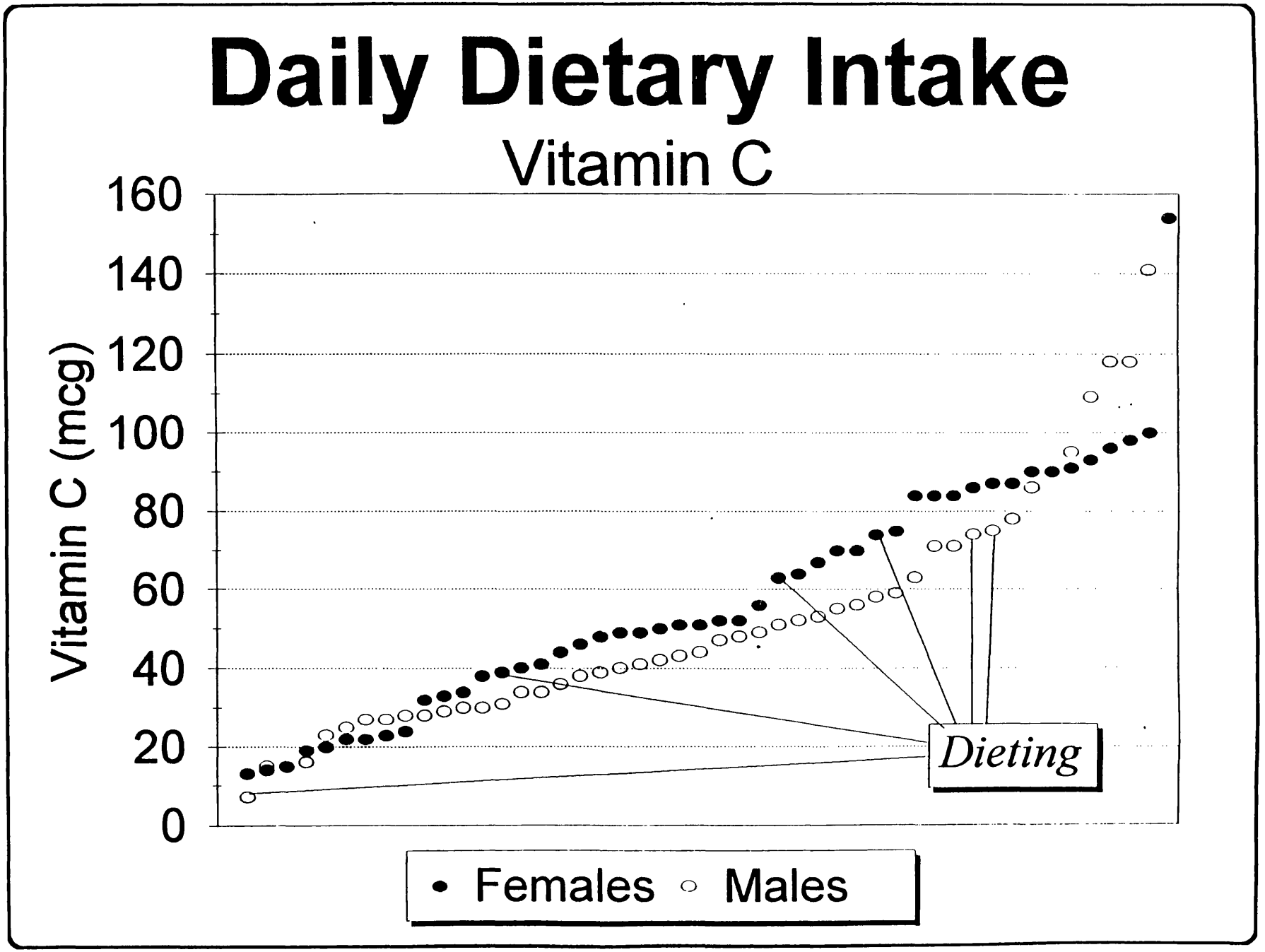

Daily Dietary Intake
Calcium
Calcium (mg)
1600
1400
1200
1000
800
600
400
200
Dieting
Females
Males

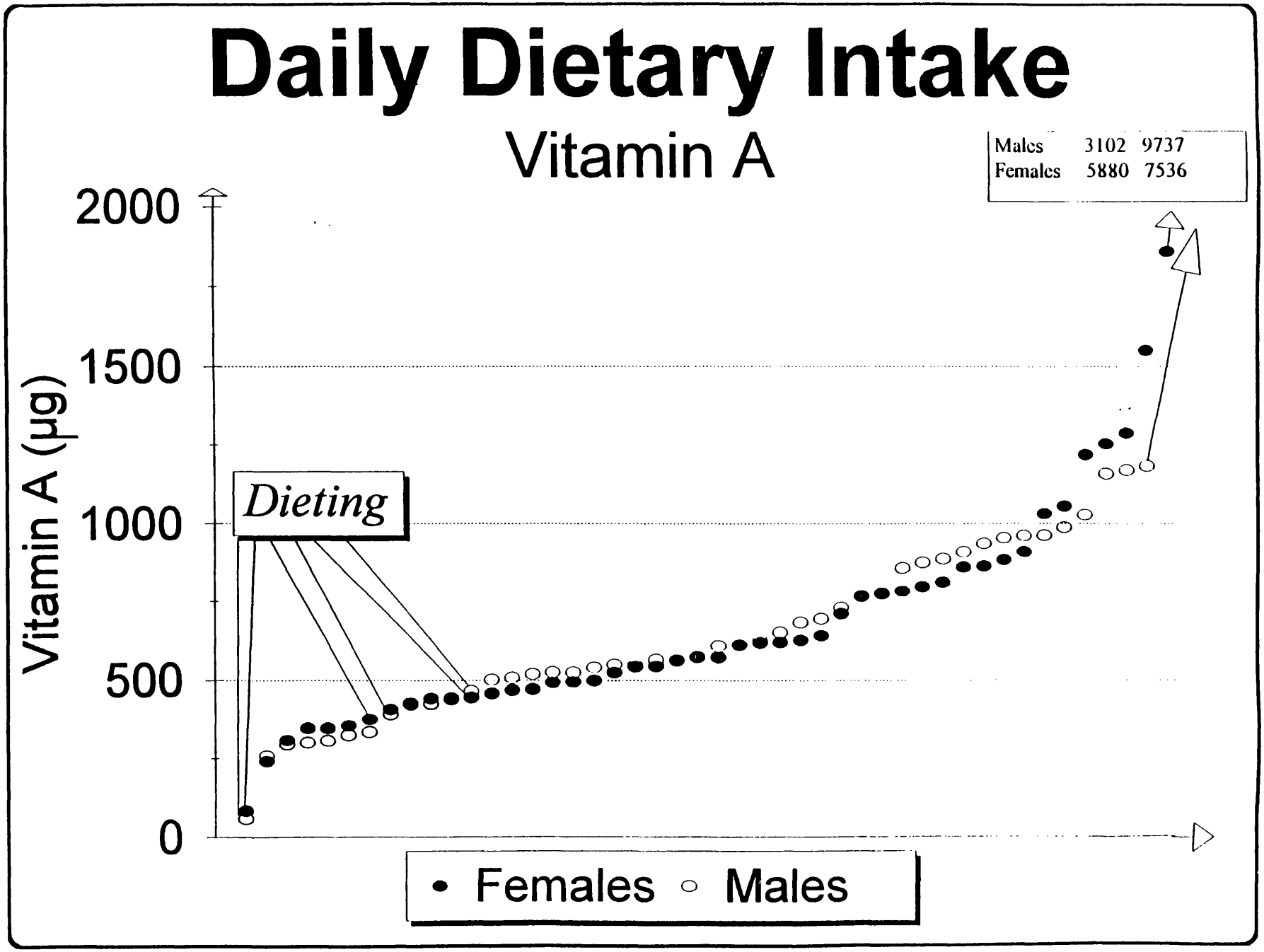

Daily Dietary Intake
Iron
Iron (mg)
25
20
15
10
5
Dieting
Females
Males


Daily Dietary Intake
Thiamin
Thiamin (mg)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
Dieting
Females
Males


Daily Dietary Intake
Riboflavin
Riboflavin (mg)
3
2.5
2
1.5
1
0.5
Dieting
Females
Males

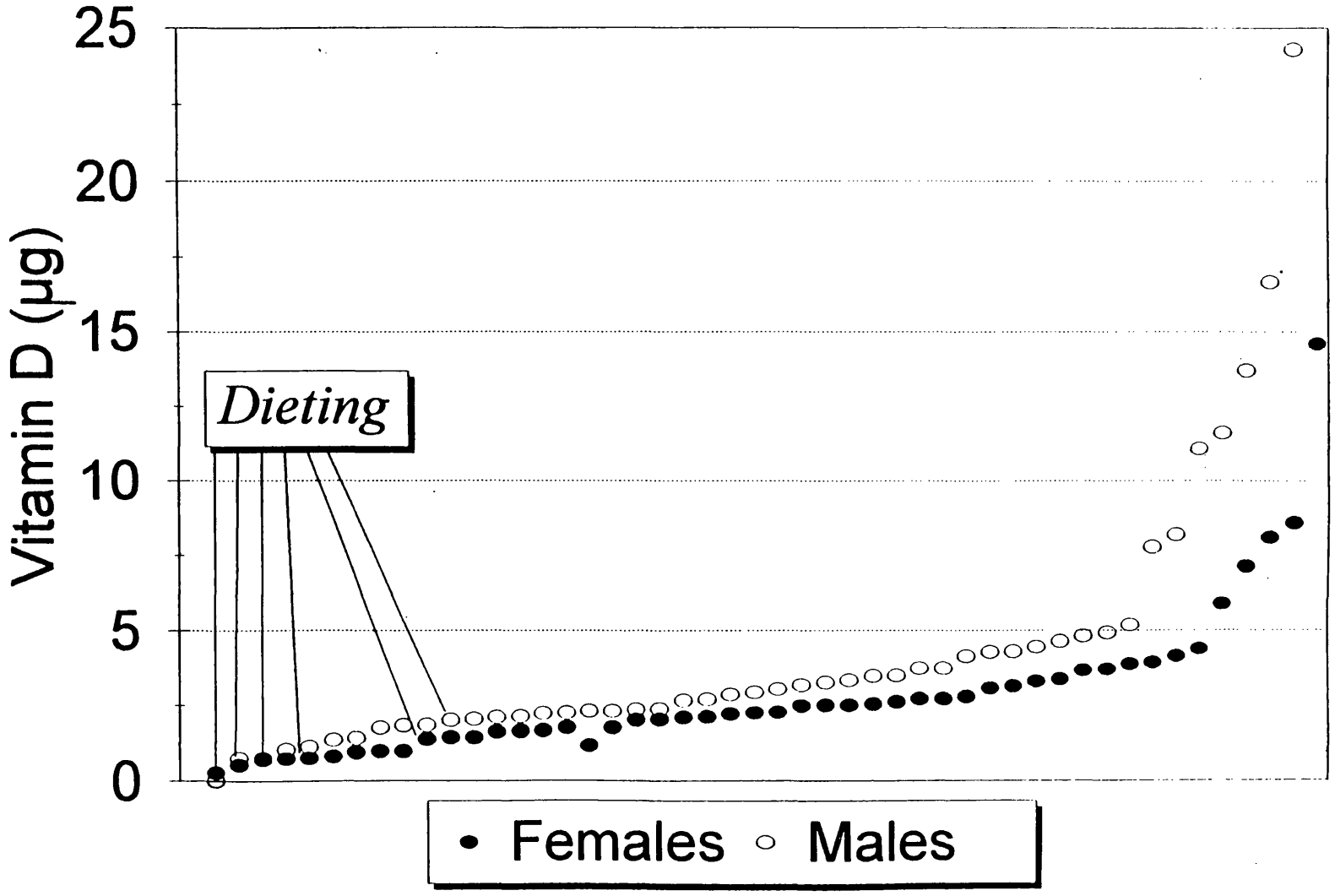

Daily Dietary Intake
NIC AC eg
NIC AC (mg)
70
60
50
40
30
20
10
Dieting
Females
Males


Daily Dietary Intake
Vitamin C
Vitamin C (mcg)
160
140
120
100
80
60
40
20
0
Dieting
Females
Males


Daily Dietary Intake
Vitamin A
Males 3102 9737
Females 5880 7536
2000
1500
1000
500
0
Vitamin A (µg)
Dieting
• Females ○ Males

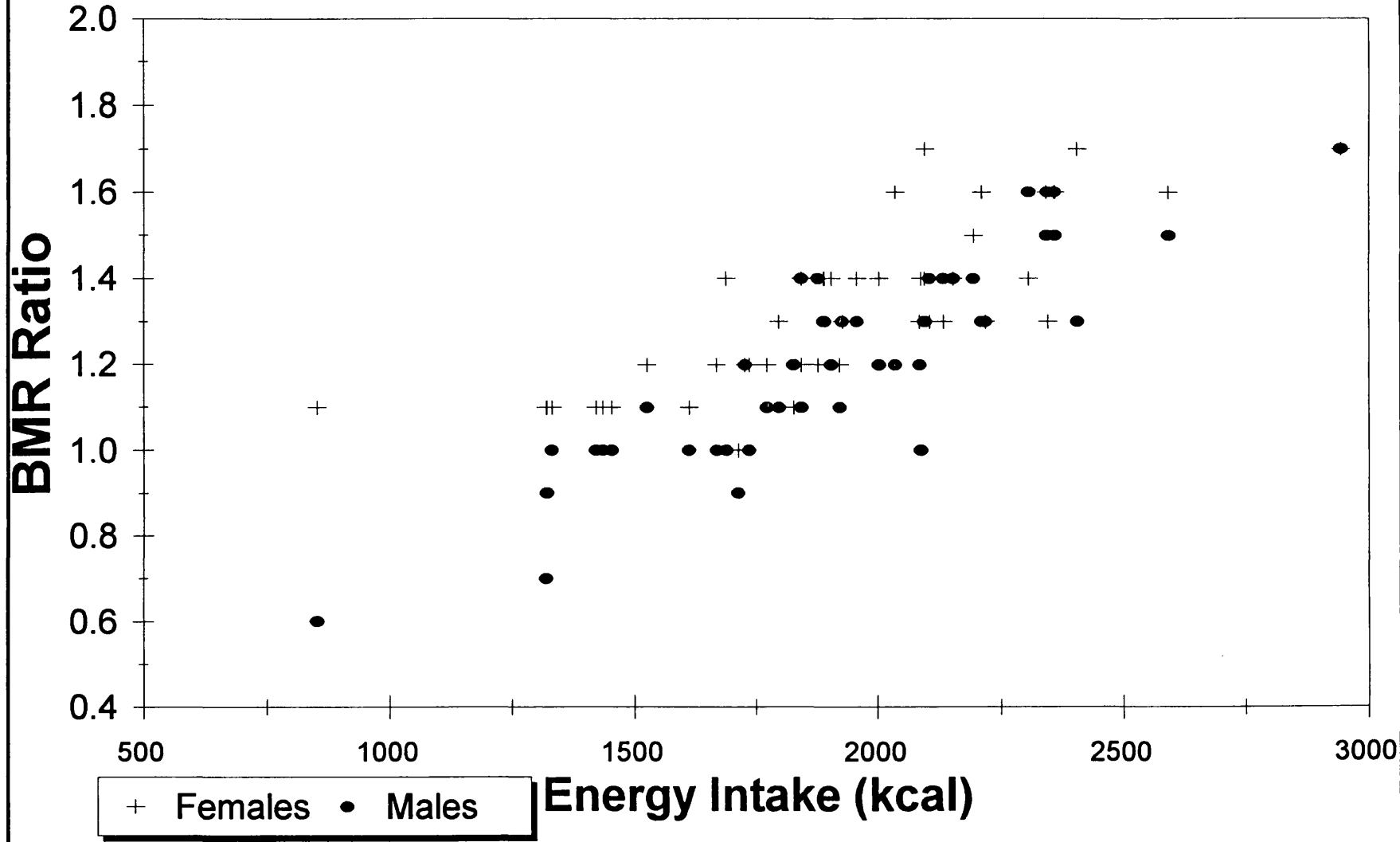
Daily Dietary Intake

Vitamin D



BMR RATIO vs ENERGY INTAKE

For Elderly Males & Females



FOOTNOTE: Some points on the graph do not represent average "normal intake". This is discussed in the text.

APPENDIX B

DETAILED TABLES - B1 - B12

- B13 - B14

TABLE - B1

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	1	2	3	4	5	6	7	8
ACTIVITY								
IN BED	570 (40)	536 (37)	540 (38)	432 (30)	491 (34)	500 (35)	480 (33)	526 (37)
SITTING	376 (26)	432 (30)	418 (29)	693 (48)	517 (36)	389 (27)	546 (38)	490 (34)
EATING	189 (13)	156 (11)	122 (9)	123 (9)	76 (5)	60 (4)	85 (6)	66 (5)
STANDING	11 (1)	19 (1)	11 (1)	24 (2)	14 (1)	26 (2)	7 (1)	23 (2)
WALKING	109 (8)	68 (5)	81 (6)	58 (4)	49 (3)	52 (4)	183 (13)	46 (3)
DRESSING & PERSONAL	78 (5)	30 (2)	62 (4)	33 (2)	55 (4)	88 (6)	58 (4)	27 (2)
HOUSEWORK	-	76 (5)	27 (2)	-	58 (4)	-	68 (5)	6 -
KITCHEN WORK	-	24 (2)	-	-	3 -	58 (4)	4 -	63 (4)
FOOD PREP	59 (4)	62 (4)	58 (4)	-	18 (1)	20 (1)	-	58 (4)
SHOPPING	-	23 (2)	39 (3)	14 (1)	29 (2)	96 (7)	9 (1)	30 (2)
GARDENING	-	-	-	-	-	151 (11)	-	105 (7)
JOINERY	-	14 (1)	-	-	-	-	-	-
BOWLING	48 (3)	-	82 (6)	63 (4)	130 (9)	-	-	-

Note: Where percentages do not add up to precisely 100%, or minutes to 1440 minutes per day, this is due to computer rounding of the figures to the nearest whole number.

TABLE - B2

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	9	10	11	12	13	14	15	16
ACTIVITY								
IN BED	488 (34)	575 (40)	498 (35)	478 (33)	477 (33)	648 (45)	495 (34)	524 (36)
SITTING	446 (31)	361 (25)	662 (46)	482 (34)	588 (41)	435 (30)	279 (19)	410 (29)
SITTING ACTS	30 (2)	329 (23)	-	-	-	-	43 (3)	-
EATING	109 (8)	16 (1)	85 (6)	107 (7)	95 (7)	187 (13)	159 (11)	100 (7)
STANDING	17 (1)	3 -	4 -	3 -	45 (3)	4 -	9 (1)	12 (1)
WALKING	50 (4)	27 (2)	53 (4)	1 -	150 (10)	24 (2)	12 (1)	37 (3)
DRESSING & PERSONAL	78 (5)	42 (3)	65 (5)	117 (8)	40 (3)	50 (4)	72 (5)	43 (3)
HOUSEWORK	27 (2)	14 (1)	4 -	45 (3)	-	23 (2)	-	-
KITCHEN WORK	7 (1)	33 (2)	59 (4)	37 (3)	27 (2)	3 -	10 (1)	-
FOOD PREP	-	13 (1)	9 (1)	85 (6)	10 (1)	37 (3)	27 (2)	37 (3)
SHOPPING	3 -	-	1 -	33 (2)	8 (1)	22 (2)	36 (3)	73 (5)
OCCASIONAL WORK	-	27 (2)	-	-	-	-	-	-
GARDENING	104 (7)	-	-	40 (3)	-	7 (1)	298 (21)	204 (14)
EXERCISE	-	-	-	12 (1)	-	-	-	-
BOWLING	81 (6)	-	-	-	-	-	-	-

TABLE - B3

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	17	18	19	20	21	22	23	24
ACTIVITY								
IN BED	492 (34)	517 (36)	634 (44)	419 (29)	527 (37)	557 (39)	472 (33)	518 (36)
SITTING	386 (27)	407 (28)	325 (23)	611 (424)	528 (37)	354 (25)	401 (28)	576 (40)
SITTING ACTS	-	-	71 (5)	-	-	-	-	108 (8)
EATING	105 (7)	115 (8)	150 (10)	68 (5)	115 (8)	122 (9)	96 (7)	60 (4)
STANDING	9 (1)	13 (1)	48 (3)	37 (3)	7 (1)	3 -	10 (1)	7 -
WALKING	50 (4)	96 (7)	50 (4)	49 (3)	9 (1)	72 (5)	17 (1)	7 -
DRESSING & PERSONAL	76 (5)	86 (6)	20 (1)	32 (2)	52 (4)	104 (7)	69 (5)	30 (2)
HOUSEWORK	111 (8)	53 (4)	32 (2)	50 (4)	-	39 (3)	35 (2)	-
KITCHEN WORK	24 (2)	30 (2)	24 (2)	21 (2)	32 (2)	69 (5)	43 (3)	12 (1)
FOOD PREP	50 (4)	62 (4)	13 (1)	81 (6)	3 -	78 (5)	30 (2)	3 -
SHOPPING	33 (2)	14 (1)	-	36 (3)	76 (5)	19 (1)	33 (2)	3 -
GARDENING	-	20 (1)	73 (5)	-	-	23 (2)	84 (6)	14 (1)
SWIMMING	27 (2)	-	-	-	-	-	-	-
EXERCISE	-	-	-	-	23 (2)	-	-	-
CLEANING CAR	-	-	-	-	-	-	43 (3)	-
JOINERY	-	27 (2)	-	-	-	-	-	-
BOWLING	58 (4)	-	-	36 (3)	-	-	-	-
GOLF	-	-	-	-	68 (5)	-	-	100 (7)
SNOOKER	19 (1)	-	-	-	-	-	-	-
BUILDING WALL	-	-	-	-	-	-	107 (7)	-

TABLE - B4

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	25	26	27	28	29	30	31	32
ACTIVITY								
IN BED	523 (36)	423 (29)	532 (37)	524 (36)	575 (40)	503 (35)	563 (39)	510 (35)
SITTING	488 (34)	277 (19)	513 (36)	508 (35)	371 (26)	513 (36)	488 (34)	448 (31)
SITTING ACTS	127 (9)	60 (4)	29 (2)	100 (7)	-	48 (3)	-	-
EATING	77 (5)	95 (7)	82 (6)	55 (4)	90 (6)	107 (7)	89 (6)	158 (11)
STANDING	-	-	14 (1)	7 (1)	30 (2)	18 (1)	9 (1)	10 (1)
WALKING	35 (2)	37 (2)	15 (1)	50 (4)	92 (6)	35 (2)	77 (5)	123 (9)
DRESSING & PERSONAL	55 (4)	98 (7)	58 (4)	44 (3)	61 (4)	74 (5)	44 (3)	50 (4)
HOUSEWORK	33 (2)	97 (7)	50 (4)	27 (2)	-	-	21 (2)	-
KITCHEN WORK	36 (3)	83 (6)	20 (1)	24 (2)	57 (4)	17 (1)	25 (2)	10 (1)
FOOD PREP	37 (3)	97 (7)	60 (4)	68 (5)	72 (5)	7 (1)	27 (2)	33 (2)
SHOPPING	12 (1)	83 (6)	10 (1)	-	39 (3)	17 (1)	-	-
GARDENING	-	90 (6)	-	33 (2)	51 (4)	102 (7)	70 (5)	50 (4)
SWIMMING	17 (1)	-	-	-	-	-	-	-
CAR REPAIRS	-	-	-	-	-	-	27 (2)	-
BOWLING	-	-	-	-	-	-	-	47 (3)
YOGA	-	-	56 (4)	-	-	-	-	-

TABLE- B5

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	33	34	35	36	37	38	39	40
ACTIVITY								
IN BED	310 (22)	455 (32)	510 (35)	498 (35)	493 (34)	557 (39)	542 (38)	503 (35)
SITTING	770 (54)	329 (23)	531 (37)	573 (40)	371 (26)	403 (28)	389 (27)	370 (26)
SITTING ACTS	-	39 (3)	21 (2)	13 (1)	49 (3)	-	-	28 (2)
EATING	90 (6)	108 (8)	69 (5)	108 (8)	73 (5)	77 (5)	114 (8)	105 (7)
STANDING	-	-	45 (3)	8 (1)	16 (1)	10 (1)	4 -	36 (3)
WALKING	10 (1)	-	145 (10)	28 (2)	89 (6)	128 (9)	23 (2)	97 (7)
DRESSING & PERSONAL	50 (4)	49 (3)	46 (3)	38 (3)	68 (5)	40 (3)	54 (4)	98 (7)
HOUSEWORK	-	194 (14)	-	20 (1)	50 (4)	-	-	35 (2)
KITCHEN WORK	-	45 (3)	19 (1)	33 (2)	21 (2)	13 (1)	-	70 (5)
FOOD PREP	40 (3)	99 (7)	-	13 (1)	95 (7)	17 (1)	63 (4)	35 (2)
SHOPPING	40 (3)	21 (2)	14 (1)	23 (2)	15 (1)	72 (5)	-	27 (2)
OCCASIONAL WORK	-	-	-	-	-	-	-	-
GARDENING	-	91 (6)	-	83 (6)	100 (7)	-	118 (8)	22 (2)
SWIMMING	-	12 (1)	-	-	-	-	-	13 (1)
CAR REPAIRS	-	-	-	-	-	-	95 (7)	-
BOWLING	90 (6)	-	40 (3)	-	-	123 (9)	37 (3)	-
DANCING	40 (3)	-	-	-	-	-	-	-

TABLE - B6

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL MALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

MALE SUBJECTS	41	42	43	44
ACTIVITY				
IN BED	465 (32)	556 (39)	492 (34)	590 (41)
SITTING	523 (36)	600 (42)	510 (35)	449 (31)
EATING	46 (3)	56 (4)	78 (5)	67 (5)
STANDING	3 -	7 (1)	-	-
WALKING	14 (1)	-	52 (4)	37 (3)
DRESSING & PERSONAL	42 (3)	35 (2)	62 (4)	55 (4)
HOUSEWORK	14 (1)	-	-	106 (7)
KITCHEN WORK	26 (2)	38 (3)	7 (1)	7 (1)
FOOD PREP	57 (4)	29 (2)	33 (2)	60 (4)
SHOPPING	116 (8)	20 (1)	18 (1)	69 (5)
OCCASIONAL WORK	134 (9)	-	-	-
GARDENING	-	57 (4)	125 (9)	-
CAR REPAIRS	-	27 (2)	-	-
JOINERY	-	15 (1)	-	-
BOWLING	-	-	63 (4)	-

TABLE - B7

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FEMALE SUBJECTS	1	2	3	4	5	6	7	8
ACTIVITY								
IN BED	543 (38)	547 (38)	553 (38)	600 (42)	564 (39)	496 (34)	497 (35)	523 (36)
SITTING	554 (39)	333 (23)	322 (22)	377 (26)	386 (27	431 (30)	412 (29)	467 (32)
SITTING ACTS	-	70 (5)	-	27 (2)	-	-	-	-
EATING	70 (5)	83 (6)	88 (6)	103 (7)	90 (6)	130 (9)	95 (7)	52 (4)
STANDING	-	10 (1)	30 (2)	-	-	13 (1)	3 -	-
WALKING	16 (1)	20 (1)	28 (2)	30 (2)	18 (1)	20 (1)	17 (1)	33 (2)
DRESSING & PERSONAL	85 (6)	60 (4)	70 (5)	73 (5)	48 (3)	73 (5)	65 (5)	57 (4)
HOUSEWORK	17 (1)	94 (7)	119 (8)	50 (4)	74 (5)	63 (4)	139 (10)	60 (4)
KITCHEN WORK	19 (1)	90 (6)	47 (3)	65 (5)	83 (6)	71 (5)	71 (5)	-
FOOD PREP	88 (6)	70 (5)	94 (7)	45 (3)	92 (6)	65 (5)	113 (8)	56 (4)
SHOPPING	48 (3)	63 (4)	89 (6)	60 (4)	5 -	78 (5)	20 (1)	-
OCCASIONAL WORK	-	-	-	-	-	-	-	152 (11)
GARDENING	-	-	-	-	-	-	8 (1)	-
BOWLING	-	-	-	-	80 (6)	-	-	40 (3)
DANCING	-	-	-	10 (1)	-	-	-	-

Note: Where percentages do not add up to precisely 100%, or minutes to 1440 minutes per day, this is due to computer rounding of the figures to the nearest whole number.

TABLE - B8

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FEMALE SUBJECTS	9	10	11	12	13	14	15	16
ACTIVITY								
IN BED	420 (29)	470 (33)	592 (41)	520 (36)	621 (43)	632 (44)	507 (35)	540 (38)
SITTING	405 (28)	467 (32)	311 (22)	527 (37)	242 (17)	258 (18)	378 (26)	487 (34)
SITTING ACTS	34 (2)	-	116 (8)	-	28 (2)	82 (6)	-	10 (1)
EATING	103 (7)	77 (5)	68 (5)	75 (5)	113 (8)	86 (6)	94 (7)	60 (4)
STANDING	-	-	13 (1)	3 -	3 -	8 (1)	27 (2)	-
WALKING	44 (3)	13 (1)	66 (5)	50 (4)	77 (5)	36 (3)	49 (3)	40 (3)
DRESSING & PERSONAL	76 (5)	70 (5)	81 (6)	40 (3)	49 (3)	90 (6)	72 (5)	94 (7)
HOUSEWORK	83 (6)	135 (9)	35 (2)	46 (3)	80 (6)	73 (5)	72 (5)	87 (6)
KITCHEN WORK	108 (8)	94 (7)	85 (6)	57 (4)	90 (6)	36 (3)	43 (3)	19 (1)
FOOD PREP	104 (7)	77 (5)	68 (5)	82 (6)	110 (8)	40 (3)	86 (6)	57 (4)
SHOPPING	63 (4)	37 (3)	5 -	40 (3)	27 (2)	99 (7)	30 (2)	43 (3)
GARDENING	-	-	-	-	-	-	11 (1)	-
DANCING	-	-	-	-	-	-	33 (2)	3 -
PAINTING	-	-	-	-	-	-	38 (3)	-

TABLE - B9

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FEMALE SUBJECTS	17	18	19	20	21	22	23	24
ACTIVITY								
IN BED	527 (37)	505 (35)	530 (37)	531 (37)	515 (36)	549 (38)	437 (30)	498 (35)
SITTING	474 (33)	454 (32)	402 (28)	396 (28)	402 (28)	381 (27)	450 (31)	369 (26)
SITTING ACTS	25 (2)	-	38 (3)	20 (1)	-	-	7 (1)	47 (3)
EATING	83 (6)	89 (6)	108 (8)	89 (6)	138 (10)	116 (8)	108 (8)	131 (9)
STANDING	10 (1)	13 (1)	-	5 -	-	23 (2)	17 (1)	10 (1)
WALKING	13 (1)	43 (3)	15 (1)	46 (3)	47 (3)	6 -	47 (3)	42 (3)
DRESSING & PERSONAL	56 (4)	82 (6)	60 (4)	102 (7)	118 (8)	60 (4)	87 (6)	49 (3)
HOUSEWORK	37 (3)	59 (4)	111 (8)	49 (3)	77 (5)	94 (7)	95 (7)	40 (3)
KITCHEN WORK	41 (3)	72 (5)	52 (4)	69 (5)	40 (3)	77 (5)	43 (3)	85 (6)
FOOD PREP	100 (7)	110 (8)	102 (7)	61 (4)	58 (4)	111 (8)	75 (5)	75 (5)
SHOPPING	37 (3)	13 (1)	7 (1)	55 (4)	30 (2)	23 (2)	67 (5)	40 (3)
OCCASIONAL WORK	37 (3)	-	-	-	-	-	-	-
GARDENING	-	-	15 (1)	-	-	-	-	42 (3)
SWIMMING	-	-	-	-	15 (1)	-	-	-
EXERCISE	-	-	-	17 (1)	-	-	-	-
CLEANING CAR	-	-	-	-	-	-	-	12 (1)
DANCING	-	-	-	-	-	-	7 (1)	-

TABLE - B10

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FEMALE SUBJECTS	25	26	27	28	29	30	31	32
ACTIVITY								
IN BED	487 (34)	531 (37)	567 (39)	513 (36)	492 (34)	436 (30)	431 (30)	441 (31)
SITTING	169 (12)	297 (21)	415 (29)	455 (32)	528 (37)	167 (12)	389 (27)	600 (42)
SITTING ACTS	253 (18)	-	-	46 (3)	7 (1)	13 (1)	60 (4)	18 (1)
EATING	107 (7)	138 (10)	92 (6)	66 (5)	96 (7)	60 (4)	99 (7)	110 (8)
STANDING	3 -	32 (2)	12 (1)	20 (1)	23 (2)	29 (2)	30 (2)	12 (1)
WALKING	107 (7)	45 (3)	33 (2)	33 (2)	22 (2)	143 (10)	33 (2)	27 (2)
DRESSING & PERSONAL	60 (4)	50 (4)	58 (4)	96 (7)	76 (5)	117 (8)	73 (5)	94 (7)
HOUSEWORK	58 (4)	73 (5)	13 (1)	99 (7)	58 (4)	10 (1)	107 (7)	46 (3)
KITCHEN WORK	39 (3)	58 (4)	96 (7)	35 (2)	33 (2)	17 (1)	60 (4)	27 (2)
FOOD PREP	63 (4)	84 (6)	75 (5)	45 (3)	76 (5)	50 (4)	128 (9)	36 (3)
SHOPPING	94 (7)	39 (3)	57 (4)	32 (2)	29 (2)	4 -	20 (1)	29 (2)
GARDENING	-	56 (4)	22 (2)	-	-	387 (27)	10 (1)	-
SWIMMING	-	12 (1)	-	-	-	6 -	-	-
EXERCISE	-	24 (2)	-	-	-	-	-	-

TABLE - B11

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FRMALE SUBJECTS	33	34	35	36	37	38	39	40
ACTIVITY								
IN BED	527 (37)	536 (37)	573 (40)	503 (35)	510 (35)	436 (30)	537 (37)	533 (37)
SITTING	398 (28)	534 (37)	219 (15)	393 (27)	482 (34)	410 (29)	423 (29)	580 (40)
SITTING ACTS	-	-	30 (2)	13 (1)	-	73 (5)	-	48 (3)
EATING	122 (9)	84 (6)	124 (9)	94 (7)	82 (6)	166 (12)	46 (3)	112 (8)
STANDING	22 (2)	2 -	37 (3)	13 (1)	12 (1)	22 (2)	-	14 (1)
WALKING	22 (2)	10 (1)	45 (3)	26 (2)	68 (5)	10 (1)	42 (3)	37 (3)
DRESSING & PERSONAL	60 (4)	46 (3)	108 (8)	122 (9)	43 (3)	68 (5)	68 (5)	36 (3)
HOUSEWORK	22 (2)	72 (5)	96 (7)	99 (7)	71 (5)	58 (4)	73 (5)	17 (1)
KITCHEN WORK	17 (1)	30 (2)	30 (2)	56 (4)	50 (4)	23 (2)	14 (1)	-
FOOD PREP	43 (3)	101 (7)	156 (11)	76 (5)	60 (4)	75 (5)	48 (3)	63 (4)
SHOPPING	-	1 -	3 -	36 (3)	62 (4)	99 (7)	20 (1)	-
OCCASIONAL WORK	-	-	-	-	-	-	153 (11)	-
GARDENING	207 (14)	24 (2)	19 (1)	9 (1)	-	-	3 -	-
SWIMMING	-	-	-	-	-	-	13 (1)	-

TABLE - B12

THE MEAN DAILY PATTERNS DURING THE EXPERIMENTAL PERIOD OF EACH INDIVIDUAL FEMALE SHOWN AS MEAN TIME AND EXPRESSED AS A (PERCENTAGE) OF THE TOTAL DAY

FEMALE SUBJECTS	41	42	43	44	45	46	47
ACTIVITY							
IN BED	493 (34)	518 (36)	590 (41)	450 (31)	483 (34)	515 (36)	497 (35)
SITTING	300 (21)	401 (28)	308 (21)	308 (21)	414 (29)	467 (32)	173 (12)
SITTING ACTS	33 (2)	58 (4)	114 (8)	137 (10)	109 (8)	-	247 (17)
EATING	107 (7)	68 (5)	86 (6)	77 (5)	55 (4)	79 (6)	55 (4)
STANDING	-	10 (1)	34 (2)	10 (1)	6 -	36 (3)	-
WALKING	37 (3)	23 (2)	37 (3)	20 (1)	13 (1)	46 (3)	47 (3)
DRESSING & PERSONAL	73 (5)	83 (6)	80 (6)	134 (9)	51 (4)	66 (5)	85 (6)
HOUSEWORK	96 (7)	70 (5)	79 (6)	87 (6)	110 (8)	78 (5)	159 (11)
KITCHEN WORK	70 (5)	104 (7)	20 (1)	96 (7)	33 (2)	65 (5)	77 (5)
FOOD PREP	73 (5)	87 (6)	53 (4)	98 (7)	123 (9)	67 (5)	63 (4)
SHOPPING	87 (6)	8 (1)	40 (3)	23 (2)	27 (2)	23 (2)	37 (3)
GARDENING	-	-	-	-	3 -	-	-
SWIMMING	-	8 (1)	-	-	-	-	-
BOWLING	33 (2)	-	-	-	-	-	-
SNOOKER	38 (3)	-	-	-	-	-	-
DANCING	-	-	-	-	13 (1)	-	-

TABLE - B13

COMPARISON OF INDIVIDUAL MEAN VALUES OF ENERGY INTAKE AND ESTIMATED EXPENDITURE (KCAL/DAY) FOR ELDERLY MALES (MEANS STANDARD DEVIATIONS AND ENERGY INTAKE EXPRESSED AS A PERCENTAGE OF ENERGY EXPENDITURE)

SUBJECT	WEIGHT (KG)	INTAKE	EXPENDITURE	MEAN % CALORIE BALANCE
MALES	53.6	1527	1814	84%
	55.0	1878	2187	86%
	55.6	1844	1856	99%
	59.4	1889	2066	91%
	60.8	2345	1958	120%
	61.6[2]	1332	2061	65%
	62.6	1928	2256	85%
	63.2	1958	1848	106%
	64.0	2307	2270	102%
	64.0	2358	2042	100%
	65.2	1454	2219	70%
	66.0	1891	2417	78%
	66.0	1436	1920	75%
	66.0	1728	2075	83%
	-	1931[1]	-	-
	66.4	1421	2073	68%
	66.8[2]	852	2011	42%
	66.8	2134	2344	91%
	67.8	1828	2108	87%
	68.6	1322	2216	60%
	70.4	1904	2227	85%
	71.6	2342	2350	100%
	72.4	2105	2176	93%
	74.2	2089	2115	99%
	75.6	2359	2544	93%
	76.0	2154	2304	93%
	76.0	2196	2061	107%
	76.8	1690	2079	81%
	77.2	2097	2324	90%
	77.4	1774	2233	106%

TABLE - B13

COMPARISON OF INDIVIDUAL MEAN VALUES OF ENERGY INTAKE AND ESTIMATED EXPENDITURE (KCAL/DAY) FOR ELDERLY MALES (MEANS STANDARD DEVIATIONS AND ENERGY INTAKE EXPRESSED AS A PERCENTAGE OF ENERGY EXPENDITURE) (CONT'D)

SUBJECT	WEIGHT (KG)	INTAKE	EXPENDITURE	MEAN % CALORIE BALANCE
MALES (Cont)	78.4	1612	2063	78%
	78.4	2096	2014	104%
	78.6	2003	2033	99%
	79.6	2212	2301	96%
	80.2	1844	2285	81%
	80.6	2036	2328	87%
	82.0	1798	2347	77%
	-	1737[1]	-	-
	86.0	2219	2794	79%
	85.4	1670[1]	-	-
	88.2	2943	2465	119%
	89.8	2086	2696	77%
	91.0	2405	2586	93%
	91.4	2593	2680	97%
	91.6	1922	2410	80%
	95.0[2]	1320	2116	55%
	100.0	1714	2526	68%
MEAN =	73.5	1986	2231	
SD =	11.0	334.4	235.3	
ND =	41	41	41	

Group mean daily energy intake = 1986 Group mean estimated energy expenditure = 2231
Group mean estimated basal metabolic rate = 1577 Group mean estimated basal metabolic rate = 1577

E1/BMR = 1.3 Estimated PAL = 1.4

NOTE: These values have not been included in the means as

[1] - only took part in weighed food record.

[2] - Males were on weight reducing diets at time of study.

TABLE - B14

COMPARISON OF INDIVIDUAL MEAN VALUES OF ENERGY INTAKE AND ESTIMATED EXPENDITURE (KCAL/DAY) FOR ELDERLY FEMALES (MEANS STANDARD DEVIATIONS AND ENERGY INTAKE EXPRESSED AS A PERCENTAGE OF ENERGY EXPENDITURE)

SUBJECT	WEIGHT (KG)	INTAKE	EXPENDITURE	MEAN % CALORIE BALANCE
FEMALES	40.4	1764	1511	117%
	46.8	1751	1636	107%
	49.4[1]	2216	-	-
	48.0	1537	1584	97%
	51.8	1883	1789	105%
	52.6	1667	1762	95%
	54.6	1326	1932	69%
	55.4	1442	1647	88%
	55.6	1659	1617	103%
	56.2	1665	1782	93%
	57.2	1651	1756	94%
	57.2	1761	1622	109%
	57.2	1744	1595	109%
	57.4	2119	2354	90%
	60.4	1606	1694	95%
	60.6	2012	1809	111%
	60.8	1764	1615	109%
	61.8[2]	1377	1837	75%
	62.0	1848	1706	108%
	62.5[2]	1404	1891	74%
	62.6	1743	1761	99%
	63.2	1550	1727	90%
	63.4	1416	1769	80%
	63.6	1409	1752	80%
	63.6	1432	1692	85%
	64.4	1520	1868	81%
	65.6	2109	1766	119%
	65.8	1809	1779	102%

TABLE - B14

COMPARISON OF INDIVIDUAL MEAN VALUES OF ENERGY INTAKE AND ESTIMATED EXPENDITURE (KCAL/DAY) FOR ELDERLY FEMALES (MEANS STANDARD DEVIATIONS AND ENERGY INTAKE EXPRESSED AS A PERCENTAGE OF ENERGY EXPENDITURE) (CONT'D)

SUBJECT	WEIGHT (KG)	INTAKE	EXPENDITURE	MEAN % CALORIE BALANCE
FEMALES (Cont)	66.6	2037	1750	116%
	66.8	1632	1847	88%
	67.4	1407	1941	72%
	68.0	2187	1769	124%
	68.8	1560	1793	87%
	68.8	1698	1845	81%
	69.8	2123	1866	114%
	70.4	1652	1898	87%
	70.6	1754	1952	90%
	72.0	1563	1843	85%
	72.4	1451	2147	68%
	72.8	1925	1877	103%
	73.0	1804	1873	96%
	73.6	1684	1965	86%
	75.0	1788	1830	98%
	84.6	1614	1976	82%
	84.8	2353	2189	107%
	86.0	1892	1870	101%
	88.2	2010	2027	99%
	102.5[2]	1544	2369	65%
MEAN =	64.7	1735	1813	
SD =	10.3	235.0	163.9	
ND =	44	44	44	

Group mean daily energy intake = 1735
Group mean estimated basal metabolic rate = 1283

E1/BMR = 1.4

Group mean estimated energy expenditure = 1813
Group mean estimated basal metabolic rate = 1283

Estimated PAL = 1.4

NOTE: These values have not been included in the means as

[1] only took part in weighed food record

[2] females were on weight reducing diets at the time of the study

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